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A REVISION OF THE COMMENSAL GOBIID FISH GENERA *PLEUROSICYA* AND *LUPOSICYA* (GOBIIDAE), WITH DESCRIPTIONS OF EIGHT NEW SPECIES OF *PLEUROSICYA* AND DISCUSSION OF RELATED GENERA.

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ABSTRACT

The tropical Indo-Pacific coral reef goby genera *Luposicya* Smith and *Pleurosicya* Weber are reviewed. *Luposicya* is represented by a single species, *L. lupus*, which is redescribed here. *Pleurosicya* is represented by 16 species of which eight (*P. annandalei* Hornell and Fowler, *P. bilobata* (Koumans), *P. boldinghi* Weber, *P. labiata* (Weber), *P. michieli* Fourmanoir, *P. mossambica* Smith, *P. muscarum* (Jordan and Scale) and *P. prognatha* Goren) were previously known and are redescribed here. Eight species of *Pleurosicya* are described as new (*P. australis*, *P. carolinensis*, *P. coerulea*, *P. elongata*, *P. fringilla*, *P. spongicola*, *P. occidentalis* and *P. plicata* spp nov.). The species of the genus can be distinguished from established taxa by a combination of characters which may include the amount of scalation, pectoral ray counts, extent of gill opening, jaw and tongue structure, tooth shape and arrangement, colour pattern, preferred host organism and specificity, and proportions of the head and body. All *Pleurosicya* species are commensal on a variety of invertebrates and plants, particularly sponges, corals, soft corals, gorgonians, seagrasses and algae, and several species are host specific. A key is given to the species of *Pleurosicya* and to differentiate the genus from allied genera (*Bryaninops, Lobulogobius, Luposicya* and *Phyllogobius*).

KEYWORDS: Gobiidae, taxonomy, new species, Indo-Pacific, commensals, corals, sponges, soft corals, gorgonians, invertebrates, *Bryaninops, Lobulogobius, Luposicya, Phyllogobius, Pleurosicya.*

INTRODUCTION

In 1913, Weber described the goby genus *Pleurosicya*, nominating *P. boldinghi* Weber, 1913 from New Guinea as the type species. Larson and Hoese (1980) redescribed *P. boldinghi* and *P. annandalei* Hornell and Fowler, 1922, and further defined the genus. In addition, they selected a lectotype for *P. bilobata* (Koumans, 1941), which was originally described from material consisting of two species. Additional *Pleurosicya* species have been described by Jordan and Seale (1906), Weber (1913), Smith (1959), Plessis and Fourmanoir (1966), Fourmanoir (1971) and Goren (1984). There are eleven nominal species in the genus, eight of which are considered here to be valid. Eight additional undescribed species have been found, from museum material and recent collections made by the author and colleagues, mostly in the western Pacific and northern Australia.

All of the species of *Pleurosicya* are commensal, mostly on alcyonarians (soft corals); they are found also on sponges, reef corals, tunicates, seagrasses and green algae. Hornell and Fowler (1922) were first to realise that commensalism occurred in the genus when they discovered *P. annandalei* living among the hollow branches of the gorgonian *Soleuocaulon tortuosum*. However, in many museum collections examined by the author, fishes were collected from rotenone stations, with no record kept of any associated invertebrate. Some species are known to be species-specific as to host, whereas many others are specific only to the type of invertebrate host (e.g. found on soft corals but never on sponges). Several species are known only from a few specimens, with fresh colours and host organism unknown. Specimens of *Pleurosicya* and related genera are often overlooked by collectors and are not always well-represented in museum collections. Therefore the distribu-

tion presently known for many species largely reflects collecting effort, with species found from the Red Sea to Rapa Island in the South Pacific.

Smith (1959) described the genus *Luposicya* (with a single species, *L.lupus* Smith, 1959), distinguishing it from *Pleurosicya* by its restricted gill opening with "....1st gillslit closed by membrane, no outer rakers" and "different shape of head and mouth" (Smith 1959). *Luposicya* does have a unique shape of head and mouth, but the first gillslit is only partly closed, as in *Pleurosicya*. *Luposicya*, redescribed below, is retained here as a monotypic genus, with several characters separating it from *Pleurosicya* and related genera. It is known from the Red Sea to Fiji, with many apparent gaps in its distribution.

Luposicya and *Pleurosicya* are closely related to the genera *Bryaninops*, *Lobulogobius* and *Phyllogobius*; all genera share a similar pelvic fin form in which the usually cup-like fins have a fleshy, forwardly-folded frenum, and distinctive lobes around the pelvic fin spines. The Greek *sikya* (feminine), an old word for a cupping-glass, aptly describes the cup-like pelvic fins of these fishes. A key to these genera is given below.

METHODS

Counts and measurements follow those in Larson and Hoese (1980). Measurements were taken to the nearest tenth of a millimetre; percentages have been rounded to the nearest whole number. Numbers in parentheses after counts represent sample size. A key to the species of *Pleurosicya* is given after the generic diagnosis. Species descriptions are presented in alphabetical order. Proportional measurements of specimens of *Luposicya* are given in Table 1. For each species of *Pleurosicya*, measurements are given for holotypes (Table 2), range of morphometrics of specimens examined (Table 3), frequency of dorsal and anal fin ray counts (Table 4), frequency of pectoral fin rays (Table 5), and number of unbranched pectoral rays (Table 6).

Abbreviations used throughout the text are as follows: BDA, body depth at anus; HL, head length; SL, standard length; TRB, transverse scale rows backward. Abbreviations of institutions: AMS, Australian Museum, Sydney; ANSP, Academy of Natural Sciences, Philadelphia; BPBM, Bernice P. Bishop Museum, Honolulu; CAS, California Academy of Sciences, San Francisco; IL, Ichthyology Laboratory, Pont de Briques; LIAIP, Laboratory of Ichthyology, Akasaka Imperial Palace, Tokyo; LON, Lembaga Oseanologie Nasional, Djakarta; MNHN, Muséum National d'Histoire Naturelle, Paris; NSMT, National Science Museum, Tokyo; NTM, Northern Territory Museum, Darwin; ROM, Royal Ontario Museum, Toronto; RMNH, Rijksmuseum van Naturlijke Historie, Leiden; RUSI, J.B.L. Smith Institute of Ichthyology, Grahamstown; TAU, Tel-Aviv University, Tel-Aviv; UGM, University of Guam, Mangilao; URM, University of the Ryukyus, Naha; USNM, National Museum of Natural History, Washington; WAM, Western Australian Museum, Perth; YCM, Yokosuka City Museum, Kanagawa; ZMA, Zoologische Museum, Amsterdam; ZMH, Zoologische Museum, Hamburg; ZMUC, Zoologisk Museum, Copenhagen; ZSI, Zoological Survey of India, Calcutta.

SYSTEMATICS

Family Gobiidae Linnaeus

Key to Genera Related to *Pleurosicya*

1. Interorbital canals separate; two anterior interorbital pores present 3
1A. Interorbital canals fused,forming one canal in narrow interorbit; one (rarely two) anterior interorbital pore present 2
2. Edges of lower lip fused to underside of head, lip free anteriorly at mandibular symphysis; lip at sides of lower jaw flared outward to accommodate diagonal row of long, curved, downward- and horizontally-directed teeth outside length of dentary ... . *Luposicya*
2A. Edge of lower lip free except at mandibular symphysis; sides of lower jaw not as above; usually with rows of short straight forwardly-pointing teeth present at front of lower jaw; if teeth rows extend onto outer face of dentary, the teeth short and restricted to front of jaw ..... *Pleurosicya*
3. Pectoral rays all branched, lower rays not thickened distally (small specimens may have a few upper and lower rays unbranched); anal fin with one more soft ray than second dorsal; eyes quite small (6-7 times in head); deep-water species..... ..... *Lobulogobius*

3A. Pectoral rays with lower 2-6 rays unbranched and usually thickened distally; anal fin with same number of soft rays as second dorsal; eyes large (less than 5 times in head) 4

4. Gill opening wide, membranes fused into a free fold across isthmus; nape scaled; head broad and depressed; one species, commensal on flat-bladed sponges ..... *Phyllogobius*

4A. Gill opening variable, membranes always attached to isthmus and never form a free fold; nape naked (rarely partly scaled in front of first dorsal); ten species, often commensal on gorgonians..... *Bryaninops*

Genus *Luposicya* Smith

Luposicya Smith, 1959:217 (type species *Luposicya lupus* Smith, 1959, by original designation, from Mozambique).

Loposicya - Goren 1984:81, fig. 5, from Tiran Island, Red Sea (erratum for *Luposicya*).

Diagnosis. Small, elongate goby (up to 28 mm SL), roughly rounded anteriorly and compressed posteriorly. Second dorsal fin rays I,8; anal fin rays I,8. Pectoral fin rays usually 14. Segmented caudal rays 17. Lateral scale count 26-32, TRB 8. Gill opening restricted. Snout long and rather pointed. Upper lip bound to head at top of snout. Edge of lower lip fused to sides of jaw, free only at chin. Dentary with row of long straight teeth with anteriorly-curved tips running diagonally across outer face of jaw toward lower surface of chin.

Osteology. (Based on one 18 mm male, NTM S.12717-001). Five branchiostegal rays; no posteleithrum; no mesopterygoid; metapterygoid slender, well separated from quadrate; no preopercular process connecting slender symplectic; ectopterygoid contacting anterior edge of quadrate; palatine slender, extending about half the length of ectopterygoid; hyomandibular in contact with dorsal process of preopercle; sphenotic reaching supraoccipital; epiotics narrowly separated by posterior process of supraoccipital; supraoccipital with crest posteriorly, and antero-lateral wings; basihyal spatulate; maxilla flattened and expanded antero-laterally; premaxilla curved, with articular process expanded and broad, ascending process very long and narrow, with a large foramen at base of each ascending process just above teeth; dentary deep, expanded ventro-medially to accommodate row of large teeth that extends diagonally across outside of bone, elongate longitudinal foramen extends along most of dentary, separating inner and (diagonally) outer rows of teeth; scapula unossified; vertebrae 10 + 15 plus urostyle (= 26); dorsal ribs on first eight vertebrae (last two poorly ossified); ventral ribs on vertebrae three to ten; spinous dorsal pterygiophore formula (using Birdsong *et al.*'s 1988 formula) 3-22110; anteriorly-directed elongate ventral process of pelvic bones diverge at tips, forming a Y; pelvic spines nearly straight, pointed; caudal skeleton with lower hypural plate articulated with, but not fused, to urostyle; single epural with well-developed dorsal flange; upper hypural rod-like; parhypural free, with narrow ventral flange.

Luposicya lupus Smith
(Figs 1-4; Pl. 1a)

Luposicya lupus Smith, 1959:217 (Pinda, Mozambique); Goren 1984:80-82 (Tiran Island, Red Sea); Winterbottom and Emery 1986:48 (Salomon, Chagos Archipelago).

Loposicya lupus - Goren 1984:81, fig. 5 (erratum for *Luposicya*).

Type material. HOLOTYPE - RUSI 266 (examined by D.F. Hoese (AMS) who made his notes available).

Additional material. QUEENSLAND - AMS I.29783-001: 3(17-18.5), Lizard Island, Research Station beach, from the sponge *Phyllospongia foliascens*, 2 m depth, 3 February 1975. BPBM 33932: 2(17-19), same data as previous, but from different sponge specimen. WAM P.30052-001: 21.5 mm male, same data as previous. CAS 68074: 29 mm male, same data as previous. NTM S.12664-001: 3(14-20), same data as previous. NTM S.12663-001: 24 mm male, Lizard Island, Mrs Watson's Bay, 3-5 m depth, 19 November 1975. NTM S.12662-001: 3(16.5-23.5), Lizard Island, reef by lagoon mangrove, 1-2 m depth, 29 Jan. 1975. AMS I.29784-001: 3(16-27.5), One Tree Island, small lagoon patch reef, 19 February 1974. AMS I.20208-028: 2(18.5-22.5), One Tree Island, largest lagoon, 27 September 1971. ANSP 165110: 3(20.5-25.5), Endeavour Reef, east of Cook wreck site, 14-20m depth, 11 November 1969. NTM S.12661-001: 10 mm juvenile, Rib Reef, windward side, 12 m depth, 4 December 1980. AMS I.22611-067, 11 mm juvenile, North Escape Reef, coral garden, 3-11 m depth, 31 October 1981. IRIAN JAYA - USNM 306880:

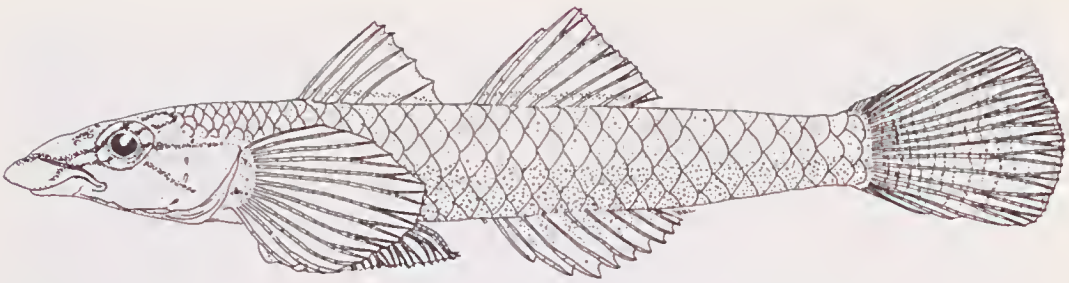


Fig. 1. 21.5 mm male *Luposicya lupus* (unregistered AMS) from Lizard Island, Queensland.

21 mm male, Batanta Island. CHAGOS ARCHIPELAGO - ROM 58020: 20 mm male, Salomon Island, 5-7 m depth, 20 March 1979. RED SEA - USNM 306881: Ethiopia, west of Harat Island, Sheikh el Abu, 0-4 m depth, 14 August 1969, 3(18-24). FIJI - ROM 58021: 3(10-22.5), Kandavu, Astrolabe Reef, Yanu Yanu Island, 10-16 m, among corals, sponges and gorgonians, A. Emery et al., 25 March 1983.

Diagnosis. As for genus.

Description. An asterisk indicates counts taken from the holotype. Based on 31 specimens, 10-27.5 mm SL. First dorsal VI (30)*. Second dorsal I,7 (2); I,8 (26)*; I,9 (2). Anal I,7 (1); I,8 (27)*; I,9 (2). Pectoral rays 13 (6), 14 (20), 15 (4)*; lowermost 3-6 rays unbranched, sometimes with skin surrounding unbranched rays thickened; specimens 10-14 mm or less with all rays unbranched. Branched caudal rays 11 (4). Longitudinal scale count 26-32, with mean of 29 (approximately 30 in holotype). TRB 8-10, mean of 9*. Gill rakers very reduced bumps, raker at angle of arch longest. Rakers on first arch 0+1+2 (2), 2+1+1 (1). Lower quarter of first arch bound by membrane to opercular wall. Vertebrae 10+16 (including urostyle) = 26 (1).

Head and body elongate (Fig. 1), roughly triangular in cross-section (apex dorsally) up to behind pectoral fins, rest of body compressed. Body depth at anus averages 14% (11-17%) of SL. Head length 29% (26-32%) of SL, head width greater than head depth. Snout long, 40% of head length. From above, snout elongate, pointed to rounded at tip. Anterior nostrils in short tube, posterior with low rim. Gill opening restricted, ranging from just past lower pectoral base to below preopercular margin. Upper jaw non-protrusible, skin of upper lip bound to head at top of snout. Eye 27% (23-31%) of head length, placed dorsolaterally. Interorbit usually very narrow, 7% (3-11%) of head length. Mouth subterminal, upper jaw overhangs lower. Jaws reach to below anterior half or edge of eye. Males tend to have larger mouths (47% of HL versus 43% in females). Tongue wide at base, narrowing abruptly to thin pointed tip. Lower lip smoothly fused to underside of head except for short free fold behind mandibular symphysis (Fig. 2).

Teeth similar in both male and female. Upper jaw with band of small fine pointed teeth; band widest across front of jaw (about 5-6 rows deep), narrowing at sides to only one row of teeth toward edentulous gap at posterior part of jaw, with 2-3 teeth on downward-curving end of premaxilla. Outermost row consists of 5-10 large curved canines across front of jaw, with largest teeth toward side of jaw and smallest in centre. Lower jaw characterised by outermost row of long, generally straight teeth (Fig. 3), row begins on outer

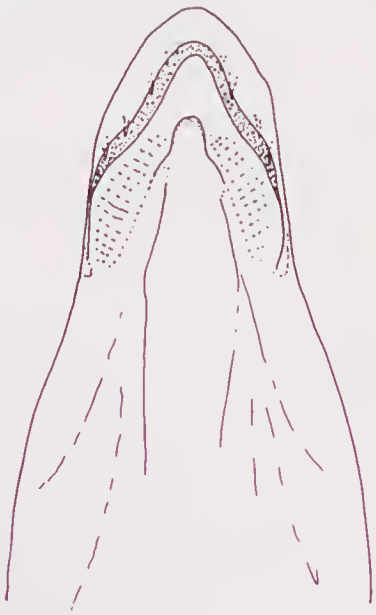


Fig. 2. Underside of head of male *Luposicya lupus* (WAM P.30052-001), showing lower lip fused to sides of jaw, and free anteriorly.

Table 1. Proportional measurements of *Luposicya lupus*, expressed as percentage of standard length (or head length where indicated).

	Males			Females		
	Range	Mean	N	Range	Mean	N
Standard length	18-27.5	22	16	14-24.5	19	9
Head length in SL	26-32	29	16	27.6-30.7	29	9
Head depth in SL	37.7-49.2	44	15	39.6-48.8	45	9
Head width in SL	44.6-57.8	52	15	47.5-60.4	53	9
Body depth at anus	11.4-16.7	14	15	13.2-15.6	14	9
Caudal length in SL	20.4-24.5	23	12	22.9-25	24	7
Pect. length in SL	16.2-20	18	16	16-19.3	18	6
Pelv. length in SL	18.6-22.5	21	16	19.2-24.2	21	9
Caud. ped. l. in SL	19.6-25.1	23	16	21.4-30	25	9
Caud. ped. d. in SL	7.1-10	9	16	7.9-10.3	9	9
Snout in HL	32.7-47.5	40	16	32.6-43.5	38	9
Eye in HL	23-31.1	28	16	24.5-30.4	27	9
Mouth in HL	40-62.1	47	16	39.3-45.7	43	9
Interorbit in HL	2.7-9.8	7	16	2.9-10.6	7	9

surface of dentary at inner corner of mouth, and runs diagonally downward and forward across outer face of bone to just below chin (by start of lower lip fold). Tips of teeth slightly bent anteriorly, especially those anteriormost. Innermost row of small, upright teeth extending up to symphysis, with one to three pairs of very large inwardly curved canines at symphysis. Innermost row of small teeth may consist of 2-3 rows of teeth at anterior half of jaw. A middle row of outward and downwardly directed straight teeth with curved tips, tips of teeth lie alongside outermost row of large teeth. No vomerine teeth.

Lateral line canals on head as in Figure 4. Anterior interorbital pore always single, usually in centre of interorbit. Three preopercular pores. Sensory papillae as in Figure 4, with suborbital and preopercular edges smooth, not scalloped or knobbed. Innermost row of mandibular papillae ends just above lower lip fold at chin.

Fig. 3. Lateral view of teeth and jaws of *Luposicya lupus* (NTM S.12717-001).

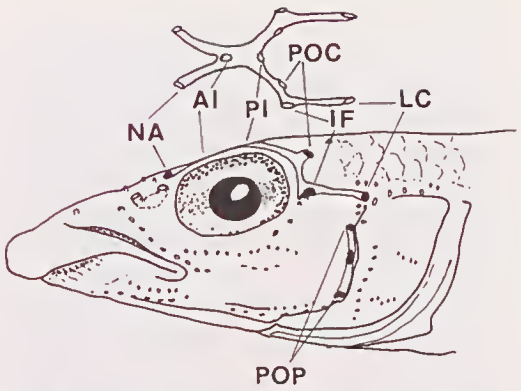


Fig. 4. Sensory papillae of *Luposicya lupus* (WAM P.30052-001), and diagrammatic dorsal view of canals and pores. **NA**, nasal pores, **AI**, anterior interorbital pore, **PI**, posterior interorbital pore, **POC**, postocular pores, **IF**, infraorbital pores, **LC**, lateral canal pores, **POP**, preopercular pores.

Scales on body extend on nape up to above preopercular edge in adults, nape naked in specimens 15mm SL or less. All scales ctenoid. Scales absent from pectoral base, breast and belly midline.

Pelvic fins long, reaching to or past anus when flattened, 21% of SL. Fin usually an elongated oval or flattened cup shape. Base of fifth pelvic ray slender, ray branched about three times. Lobes around pelvic spines flattened, rounded to pointed, and not usually particularly fleshy, fimbriate or folded. Frenum thin to somewhat fleshy, not usually fimbriate, and only folded forward slightly (occasionally not at all). Pelvic spines straight to very slightly curved inward. Pectoral fins short, reaching back to below sixth dorsal spine. First dorsal fin triangular, first spine about equal to greatest body depth. Second dorsal fin also somewhat triangular, equal in height to first dorsal anteriorly, and very low posteriorly. Dorsal rays branched in adults, may be unbranched in specimens 15 mm SL or less. Anal fin low, slightly higher anteriorly, all rays unbranched. Caudal fin truncate to rounded.

Genital papilla in females short, slightly flattened to bulbous, with fine fimbriate lobes in clump on each side of opening. Male genital papilla short, thin and flattened, with several fimbriate lobes across expanded tip.

Colour in life. Head and body transparent to translucent light greenish, with skin surface lightly covered with small dark brown speckles, including branchiostegal membranes.

Peritoneum silvery white to cream coloured, with three dark brown oblong blotches covering most of sides of abdominal cavity. Brain and vertebral column cream to whitish, with seven dark brown elongate internal blotches evenly spaced atop vertebral column, starting from just behind brain. First blotch appears on skin surface as dense dark brown streak at nape midline. Four short dark brown internal streaks over brain surface form "V" behind each eye, apex pointing to nape midline. "V" streaks may be irregular, but always present. Two dark brown lines extend forward from front of eye; uppermost running along snout to outer edge of upper lip, lowermost extends to middle of jaw and may extend onto upper lip. Bright golden patches may be present on snout between lines. Behind eye run two brown lines (continuations of snout markings); upper line extends across top of preopercle and fades out at upper opercular attachment, lower streak runs diagonally down across preopercle and ends on opercle (both lines may be quite diffuse). Eyeball light red gold to golden brown, iris pinkish gold marbled with brown, rim of eye red brown. Lines before and after eyes (including lowermost nape streak) continue onto iris as dark red brown diffuse lines. Two lines extend up from iris toward nape, meeting diffuse blotch in centre of narrow interorbit. Pectoral base often densely speckled with dark brown, and short distinct streak sometimes present (continuation of lower posterior eye line). Two or three bright white spots on upper pectoral base. Along midside of body, a fine dark brown line runs from pectoral base to base of caudal. Row of bright white spots placed evenly along line (as on vertebral column). Fine line may be reduced to diffuse spots, but bright white spots always visible. Dorsal midline with dark brown paired lines or spots along fin bases and nape. Both dorsals with diffuse brown line just above base of fin, and trailing edges of fins lightly dusted with brown. Anal fin speckled with dark brown, especially along base. Caudal fin barred, with about 10 narrow wavy brown vertical lines. Pectorals slightly dusky to transparent, and pelvics transparent.

Colour in alcohol. Fine dark brown speckles remain on head and body, including lips and branchiostegal membranes, but leaving breast, belly and isthmus unmarked. Brown pigment spots usually larger on lower half of body and head. Most conspicuous marking is dense black or dark brown streak on midline of nape behind eyes (streak may equal eye length). More diffuse short streaks or spots present along each side of dorsal fin bases. First dorsal with dense dark stripe just above base; similar, but more diffuse, stripe on second dorsal. Other fins retain pattern shown when live. Eye lines and other head markings generally less distinct upon preservation. Sides of head usually densely speckled, with stripes across preopercle and opercle not visible. Irregular brown blotches present on centre of snout. "V"-shaped pattern behind eyes obscured by skin and surface musculature, but generally visible.

Comparisons. At first glance, *Luposicya* appears most like *Pleurosicya*, with its similar headpore arrangement, scaled nape and restricted gill opening. However, it differs from *Pleurosicya* by three main characters. These are: the lower lip free only behind the mandibular symphysis, the diagonal row of large teeth crossing the outer face of the dentary, and the premaxilla with a large foramen below the ascending process. *Luposicya* also has very rudimentary gill rakers on the first arch, often with none on the upper limb; unlike *Pleurosicya*, which has usually 1-3 small rakers on the upper limb, and up to 8 on the lower.

Remarks. *Luposicya* has an Indo-West Pacific distribution, previously recorded from South Africa (type locality), the Chagos Archipelago (Winterbottom and Emery 1986) and the Red Sea (Goren 1984). It occurs on the Great Barrier Reef from One Tree Island in the Capricorn Group north to Escape Reef. The record of *Luposicya* from Japan in Masuda *et al.* (1984) refers to a specimen of *Pleurosicya* (probably *P. labiatus*), apparently now lost. Despite reasonable collecting effort, *Luposicya* has not yet been found in Japan or the Philippines, and is known in Indonesia only from Batanta Island in Irian Jaya.

This species is commensal on sponges, although it has been collected together with its host only from Lizard Island, One Tree Island and Rib Reef, whereas all other records of the species have not included the host invertebrate. At Lizard Island, *Luposicya* has nearly always been found on *Phyllospongia foliascens* (Pallas) (*sensu* Bergquist 1969). This is typically a cup-shaped sponge, dull whitish with vermiculated grooves of greyish green (Pl. Ia). At Rib Reef, *Luposicya* was collected from upright, flat, thin, foliaceous purplish

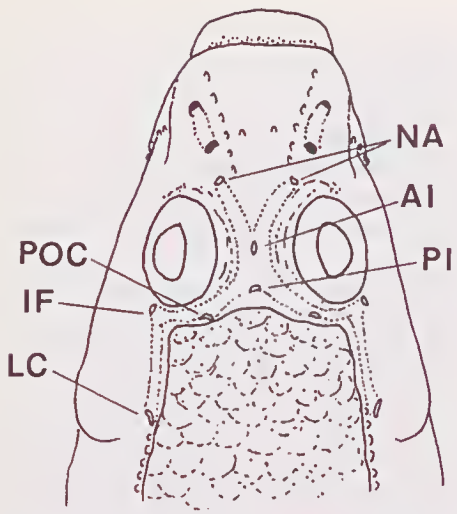


Fig. 5. Dorsal view of head of *Pleurosicya boldinghi* lectotype (ZMA 100.209), showing lateral canal pores and scalation. **NA**, nasal pores, **AI**, anterior interorbital pore, **PI**, posterior interorbital pore, **POC**, postocular pores, **IF**, infraorbital pores, **LC**, lateral canal pores.

brown sponges of another species of *Phyllospongia* (possibly *P.papyracea* (Esper), *sensu* Lendenfeld 1889). The flathead sponge-goby, *Phyllogobius platycephalops* (Smith), is commensal on the same species of sponge at Rib Reef (and elsewhere), but the two fish species have not been collected together on the same sponge specimen. *Luposicya* and *Phyllospongia* have been found together in quite shallow lagoonal habitats (from less than 1 m to 6 m in depth), on coral sand and rubble substrates, often near rich coral cover.

Tyler and Bohlke (1972) and Gilbert and Burgess (1986) noted that there were no records of sponge-dwelling fishes from the Indo-Pacific. Larson (1985) described the first sponge-dwelling goby from the Pacific, *Bryaninops dianneae*, commensal on "a green sponge" from Fiji. The sponge has since been identified as *Haliclona* sp. (Larson 1987).

The gut contents of five adult *Luposicya* were examined. The gut form is simple, with a long, single-looped intestine. All guts were filled with soft elastic globular clumps of mucus, with a few sand grains, diatoms, algal fragments and several types of sponge spicules mixed in. Two fish had the gut quite tightly-packed with these mucus balls. It is assumed that the mucus came from the host sponge. The unusual dentition of this species is well-shaped for scooping up mucus (and embedded particles) from the host sponge surface. I have not yet observed feeding behaviour in this species.

One large *Luposicya* specimen has been observed guarding a patch of eggs. The eggs were on the inside of a large cup-shaped sponge (probably *Phyllospongia*, but not verified), laid in a rounded patch about 3 cm in diameter. There were many specimens of *Luposicya* present on the sponge, but only one very large one, which sat on top of the egg patch, vibrating the pectorals and body very slightly. Despite my disturbing the sponge and its other inhabitants, by catching a large *Pleurosicya* which was also present, the *Luposicya* did not move from the egg patch.

Genus *Pleurosicya* Weber

Pleurosicya Weber, 1913:456-457 (type species *Pleurosicya boldinghi* Weber, 1913, by original designation, from New Guinea).

Cottogobius Koumans, 1941:253-254 (type species *Cottogobius bilobatus* Koumans, 1941, by original designation, from India).

Pleurosicyops Smith, 1959:217 (type species *Pleurosicyops timidus* Smith, 1959, by original designation, from Mozambique).

Pleurosycia Plessis and Fourmanoir, 1966:764 (erratum for *Pleurosicya*).

Diagnosis. Small gobies with fleshy lobes around the pelvic spines and forwardly-folded pelvic frenum. Eyes generally large and placed dorsolaterally. Interorbital narrow, often less than pupil diameter. Second dorsal rays I,7-9; anal rays 1,7-9. Segmented caudal rays 17. Lateral scales 20-28; TRB 7-10. Scales ctenoid, absent from breast, pectoral base and belly; nape scaled to naked. Gill opening variable, may extend forward to below eye, or be restricted to pectoral base. Edge of lower lip free at sides, fused at chin. Rows of fine pointed teeth in both jaws, usually outermost row in lower jaw horizontal and moveable, outermost row across front of upper jaw usually larger and curved, and at least one pair of large curved teeth behind symphysis of lower jaw. Sensory papillae on head reduced. Head pores and canals present as in Figure 5: nasal pore close to rear of each posterior nostril, one median anterior (rarely two) interorbital pore in single interorbital canal, one median posterior interorbital pore, a postocular pore behind each eye, an infraorbital pore on each side of head at mid-eye level, and a lateral canal pore above preopercular margin (all connected by

canals, which may be open in small specimens); three preopercular pores usually present, connected by separate canal. Commensal on invertebrates such as corals, sponges, tunicates and bivalves, also on algae and seagrass.

Osteology. (Based upon one specimen each of *P. carolinensis* (from CAS 36875), *P. coerulea* (NTM unregistered FNQ 79-38), *P. fringilla* (NTM unregistered LZ 79-25), *P. mossambica* (NTM S.12642-001), *P. plicata* (CAS 36885), and *P. prognatha* (from AMS I.22631-055)). Five branchiostegal rays; small lower postcleithrum present; no mesopterygoid (endopterygoid); metapterygoid not meeting quadrate; preopercular process connecting process on symplectic in *P. fringilla* and *P. prognatha*, and nearly so in *P. carolinensis*; palatine extending half the length of ectopterygoid; ectopterygoid with flange (broad in *P. plicata*), and in contact with small quadrate; hyomandibular in contact with dorsal process of preoperele; sphenotic reaching supraoccipital; frontals separated from epiotics; exoccipitals barely separated by rear of supraoccipital; supraoccipital with distinct crest and narrow antero-lateral wings; basihyal fan-shaped or spatulate; maxilla slender, flattened; premaxilla with articular and ascending processes well-separated except in *P. prognatha* and *P. fringilla*, in which they are very close and nearly fused in the former; dentary slender, slightly raised posteriorly in *P. plicata*, *P. fringilla*, and *P. prognatha*; scapula unossified (dorsal portion partly ossified in *P. mossambica*); vertebrae 10 + 15 plus urostyle (= 26); dorsal ribs on first eight to ten vertebrae; ventral ribs on first eight vertebrae; spinous dorsal pterygiophores (using formula of Birdsong *et al.* 1988) 3-22110; anteriorly-directed elongate ventral processes of pelvic bones diverge at tips, forming a Y; pelvic spines usually curved; caudal skeleton with upper hypural plate fused to, and lower articulated with, urostyle; single epural with broad dorsal flange; upper hypural rod-like; parhypural free, with flange; neural spine on preural vertebra (number 25) very short and broad.

Key to the Species of *Pleurosicya*

This is an artificial key, and not necessarily based on phylogenetic relationships between taxa. The key may not work with small juveniles 10-11 mm SL or less, and some specimens of *P. annandalei*, *P. micheli*, and *P. mossambica* may be difficult to distinguish using the key alone.

1. Nape naked 2
1A. Nape scaled up to behind eyes, or at least sides of nape scaled 10
2. Gill opening extends forward to below preopercle or nearly to eye 3
2A. Gill opening restricted to pectoral base.. 4
3. Tongue trilobed (rarely blunt); male without black blotch at rear of soft dorsal; pelvic spine lobes usually long and folded; fish pale, without brown bars; commensal unknown; (Indo-West Pacific) ..... *P. plicata*
3A. Tongue bilobed (occasionally blunt, rarely trilobed); male with black blotch at rear of soft dorsal; pelvic spine lobes usually not greatly expanded and folded; when live, fish green with about 12 narrow brown bars; commensal on seagrass; (Indo-West Pacific) ..... *P. bilobata*
4. Tongue very small, usually narrow and pointed (sometimes blunt or rounded); upper lip with tip elongated and fleshy, giving a bird-like profile; no small canine tooth on each side of lower jaw 5
4A. Tongue moderately broad, pointed, slightly trilobed, or round; upper lip may be fleshy, but never with elongated and pointed tip; small canine tooth may be present on each side of lower jaw 6
5. Tip of upper jaw narrow, with cartilaginous tooth-bearing projection present, covered by elongated pointed upper lip; often scales reach only to below gap between dorsals; no black spot on anal fin; (Red Sea, northern Australia) ..... *P. prognatha*
5A. Tip of upper jaw without cartilaginous projection, upper lip may be elongated and fleshy; scales on body always reach to behind pectoral base; males with black spot on anal fin anteriorly; (Indo-West Pacific) ..... *P. fringilla*
6. Enlarged teeth at sides of lower jaw (teeth may be reduced in females); which may be expanded outward at front 7
6A. No enlarged teeth at sides of lower jaw; jaw may be triangular in shape, but is not expanded at front 8
7. One or more large curved teeth at middle of each side in the triangular lower jaw, which is expanded outward at front; body slender (BDA 14-18% of SL); (Western Caroline Islands) ..... *P. carolinensis*

7A. One small to medium curved tooth at each side of lower jaw, which is triangular, but not expanded outward at front; body stocky (BDA 19-22% of SL); (Indonesia) ..... *P. spongicola*

8. Mouth terminal, snout convex; eyes relatively small (average 25% of HL); five pairs of red lines on head radiating from eye when live (not always visible in preserved material); very few lower unbranched pectoral rays (1-7, average 2); commensal on soft corals; (Indo-West Pacific).. ..... *P. muscarum*

8A. Mouth subterminal, with upper lip overhanging lower jaw; eyes moderate (averaging 29% of HL); lower unbranched pectoral rays 4-7 (average 6); probably only one pair of red or brown lines radiating from eye when live 9

9. Intense elongate black spot present on centre of nape; head width moderate (width averages 64% of HL), upper lip overhangs lower jaw, but not particularly fleshy; commensal unknown; (western Indian Ocean) ..... *P. occidentalis*

9A. Central nape spot diffuse, not always present; head quite broad (average width 72% of HL), upper lip fleshy; commensal on *Heliopora coerulea*; (Indo-Pacific) .... *P. coerulea*

10. Second dorsal rays 1,7; anal rays 1,8; no melanophores visible on head, fins or body of preserved material; fish plain white when live, with thin red or pink stripes on head; commensal on deep-water soft corals; (Indo-West Pacific) ..... *P. boldinghi*

10A. Second dorsal and anal rays usually I,8 (rarely I,7); body and fins variously pigmented (lateral stripe, or with blotch on pectoral base or first dorsal fin and at least part of body dusky) 11

11. Black blotch or streak (occasionally absent) on lower part of first dorsal fin; gill opening always wide (usually to posterior margin of eye) 12

11A. No black blotch or spotting on first dorsal fin; gill opening wide, or restricted to pectoral base ..... 13.

12. Pectoral rays 17-19 (mean 18); BDA 15-19% of SL (mean 17%); nape midline naked in 68% of specimens; in coral reef habitats (1-24 m), commensal on many organisms such as soft corals and sponges; (Red Sea, Indo-West Pacific) .... *P. mossambica*

12A. Pectoral rays 19-20 (mean 19); BDA 15-22% of SL (mean 18%); nape midline always fully scaled; offshore dredge and trawl-depth habitats in 14-70 m; host unknown; (Indo-West Pacific) .... *P. annandalei*

13. Gill opening restricted to pectoral base; one or more large curved canines usually present at each side of lower jaw 14

13A. Gill opening extends forward to at least posterior margin of eye; no curved canines at each side of lower jaw 15

14. Symphyseal canines in lower jaw always present; nape usually scaled forward up to behind eyes; BDA 17% of SL; usually commensal on barrel-shaped sponges; (Western Pacific) ..... *P. labiata*

14A. Symphyseal canines in lower jaw reduced or absent; nape scaled forward to above preopercle; BDA 14% of SL; usually commensal on fan-shaped sponges; (Timor Sea, Western Pacific) ..... *P. elongata*

15. Body slender, BDA averages 16% of SL; first dorsal sometimes may have scattered dusky markings near base, lower half of body and caudal fin with brown streak; head triangular (mean HW 57% of HL), with eyes placed dorsolaterally; commensal on hard corals; (Indo-West Pacific, Hawaii) ..... *P. micheli*

15A. Body stocky, BDA averages 20% of SL; first dorsal unpigmented, caudal fin base and lower half of fin with dark brown streak; head compressed (mean HW 53% of HL), with eyes placed laterally; commensal unknown; (Rapa and Mangareva) .... *P. australis*

Pleurosicya annandalei Hornell and Fowler

(Fig. 6)

Pleurosicya annandalei Hornell and Fowler, 1922:924 (Tuticorin, India); Larson and Hoese 1980:36 (off the coast of Somalia); Hoese, in Smith and Heemstra 1986:800 (Sodwana Bay, South Africa).

Type material. HOLOTYPE (examined by D.F. Hoese, who made his notes available to the author) - ANSP 51094: 25.1 mm SL (sex undetermined), Tuticorin, India, 14-16 m, from *Solenocaulon tortuosum*, 1922. PARALECTOTYPES of *Pleurosicya boldinghi* - from ZMA 100.209: 2(17-24.5), West New Guinea, 32 m, "Siboga" station 164, 20 August 1899.

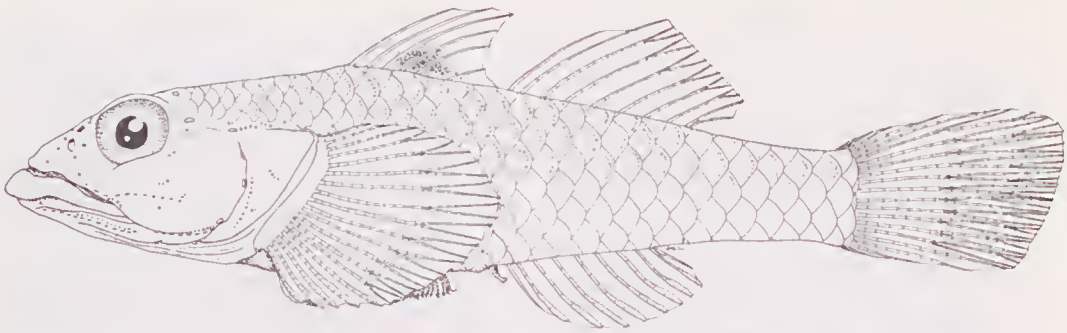


Fig. 6. *Pleurosicya annandalei* (RUSI 16091), 27 mm male, from off Mtentu, South Africa (scales mostly reconstructed).

Additional material. EAST AFRICA - AMS I.21862-001: 23 mm SL male, off coast of Somalia, trawled from 41-70 m, "Meteor" station 122, 28 December 1964. ZMH 6144: 4(21.4-24.6), off coast of Somalia, trawled from 55-65 m, "Meteor" station 123, 28 December 1964. SOUTH AFRICA - RUSI 16091: 2(21.5-27), off Mtentu, Transkei, dredged from 50 m, A.D.Connell, 12 September 1981. WESTERN AUSTRALIA - NTM S.12660-001: 2(21-28), NW of Port Hedland, Taiwanese pair trawler BYME, 29 May 1983. CSIRO H.2256-01: 25 mm male, Northwest Shelf, FRV "Soela", 9 October 1986. CSIRO H.2257-01: 23.5 mm male, 19° 27.2' S, 118° 58.6' E, 36-46 m, epibenthic sled, FRV "Soela", 8 Deecmber 1982. CSIRO H.2258-01: 21.5 mm female, 19° 59' S, 117° 51.5' E, 42 m, beam trawl, FRV "Soela", 27 August 1983. CSIRO H.2259-01: 17 mm female, 19° 59' S, 117° 51' E, 42 m, beam trawl, FRV "Soela", 25 August 1983. CSIRO H.2260-01: 14.5 mm male, 19° 43.7' S, 117° 54.4' E, 52 m, beam trawl, FRV "Soela", 2 September 1983. NTM S.12691-001: 20 mm female, 19° 29.7' S, 118° 52.1' E, 38-39 m, beam trawl, FRV "Soela", 25 October 1983. NTM S.12692-001: 16.5 mm male, 19° 55.2' S, 117° 56' E, 40 m, beam trawl, FRV "Soela", 26 October 1983. PHILIPPINES - ZMUC P.781650-1659: 10(13.5-23), Jolo, Sulu Archipelago, 27 m, Mortensen Pacific Expedition, 21 March 1914.

Diagnosis. A relatively large *Pleurosicya* with a black blotch on the first dorsal fin. First dorsal rays I,8; anal rays I,8. Pectoral rays 17-20. Lateral scales 23, TRB 8. Nape scaled up to behind eyes, including nape midline. Gill opening wide, reaching to below posterior edge of eye. Tongue usually blunt. Small cirri or pointed bumps around rear of eye in some specimens. Preferred host unknown; holotype commensal with gorgonian (*Solenocaulon*).

Description. An asterisk indicates counts of holotype. Based on 27 specimens, 13.5-28 mm SL. First dorsal VI (23)*. Second dorsal I,7 (2); I,8 (19)*; I,9 (1). Anal I,8 (21)*; I,9 (2). Pectoral rays 17 (3), 18 (9), 19 (14), 20 (2)*. Lowermost 3-5 pectoral rays unbranched, with distal half thickened (damaged in holotype). Branched caudal rays 11 (2), 12 (1)*. Predorsal scales 7-14. Longitudinal scale count 20-25 (mean 23, 24 in holotype). TRB 6-9, mean 7 (9 in holotype). Gill rakers short, 2+1+4 (2). Lowermost third of first gill arch bound to inner face of operele by membrane.

Head and anterior part of body triangular in cross-section, apex dorsally, with posterior part of body compressed. Body rather stocky, BDA averages 18% of SL (Fig. 6). Head length 32-39% of SL (mean 35%). Head width equal to or greater than head depth. Snout moderate, 24-33% of HL, rectangular in dorsal view, sometimes with bump in profile caused by ascending premaxillary process. Mouth terminal, jaws end at a point below mid-eye. Eyes moderate, averaging 27% of HL, set dorsolaterally. Nostrils in short tubes, anterior nostril tube often slightly longer; posterior nostril set near upper edge of eye, anterior nostril midway between eye and upper lip. Interorbital usually narrow, 3-11% of HL. Tongue blunt to concave, rarely weakly trilobed. Gill opening wide, reaching to below posterior margin of eye. Seven specimens (from South Africa and the Philippines) with tiny pointed bumps around the upper rear margin of eye, and sometimes in interorbital space; bumps often elongated as cirri.

First dorsal triangular, with third spine longest. Fins low, short. Anal rays unbranched. Pectoral fins rounded, reaching back to below

second dorsal fin origin or space between both dorsals. Caudal truncate to rounded. Pelvics oval, usually a flattened cup, when flattened reach to anus or slightly beyond. Frenum fleshy; pelvic spines curved inward, lobes folded and often bilobed.

Upper jaw teeth fine and pointed, arranged in band which is widest anteriorly, narrowing to two rows at sides. Outermost, six to eight large curved teeth across front of jaw, largest teeth at sides of jaw; these teeth protrude from lip. Lower jaw teeth small, sharp, in wide band of several across front of jaw, narrowing to two rows at sides; outermost row across front angle outward, moveable. A large curved tooth at either side of symphysis, behind fine tooth band.

Lateral line canals as for genus. One specimen has no anterior interorbital pore.

Nape scales extend forward to behind eyes, scale rows always crossing nape midline, even in 13.5 mm specimen. Belly midline naked.

Male genital papilla small, slender and flattened, with tiny fimbriate lobes at tip. Female genital papilla short, cylindrical, with several short lobes arranged about opening at tip.

Colour in Life. Hornell and Fowler (1922) record the live colour as being "pink over entire body" and do not report dark markings on any of the fins after preservation. No other information is available.

Colour in Alcohol. Most material is faded (and not in very good condition, as a result of being trawled), with a stripe from eye to tip of snout often faintly present. A broad blackish to brown stripe occupies the lower third of the first dorsal, sometimes this stripe reduced to a diffuse blotch between third and sixth spines. Two specimens from north-western Australia have only a few faint melanophores on the lower half of the first dorsal. Many specimens from this locality have scale margins outlined with dusky speckles, and the lower half of the body and caudal fin may be dusky. Three specimens from the Philippines have a dusky streak on the lower caudal fin (similar to *P. micheli* and *P. mossambica*).

Comparisons. This species is very close to *P. mossambica*. The two species differ from each other by pectoral ray count (mean rays 19 in *P. annandalei*, 18 in *P. mossambica*), average body depth in SL (18% in *P. annandalei*, 17% in *P. mossambica*), nape scalation (midline fully scaled in *P. annandalei*; in *P. mossambica* nape midline naked in 68% of specimens, with scales on either side reaching to behind eyes, remaining 32% of specimens with nape midline fully scaled as in *P. annandalei*), and habitat (*P. annandalei* specimens obtained by trawl, epibenthic sled, or dredge from depths of 14-70 m, *P. mossambica* found in coral reef habitats from 1-24 m).

Remarks. The holotype was found as a commensal of *Solenocaulon tortuosum*, dredged from a sandy substrate at 14 to 16 m depth. Other material has come largely from trawl or dredge samples, with no indication of host invertebrate.

Pleurosicya australis sp. nov.
(Fig. 7)

Type material. HOLOTYPE - BPBM 17280: 25 mm SL female, reef at entrance Haurei Bay, Rapa, Tubuai Islands, 15-18 m, J. Randall & D.Cannoy, 10 February 1971. PARATYPES - BPBM 13593: 2(15-18), Gambier Islands, Mangareva, 1/4 mile E of Rikitea, patch reef, 3-11 m, J.Randall, D. Cannoy, J. Haywood, 14 December 1970. BPBM 17307: 21 mm SL female, Tubuai Islands, Rapa, S side of exposed reef at entrance to Haurei Bay, 2-6 m, J. Randall & D. Cannoy, 14 February 1971.

Diagnosis. A compressed *Pleurosicya* with large mouth, laterally-placed eyes, and blotch at lower caudal base and lower part of fin. Second dorsal rays I,8; anal rays I,8. Pectoral rays 17. Lateral scales 24-25, TRB 7-8. Head with scaled nape, midline usually naked at least anteriorly. Gill opening wide, reaching to below mid-eye. Tongue blunt to slightly concave. Lower half of caudal base with black blotch. Found only in French Polynesia, at Rapa and Mangareva Islands.

Description. An asterisk indicates counts of holotype. Based on four specimens, 15-25 mm SL. First dorsal fin VI (4)*. Second dorsal I,8 (4)*. Anal I,8 (4)*. Pectoral rays 17 (4)*. Lowermost 3-5 (4 in holotype) pectoral rays unbranched and thickened distally. Branched caudal rays 11 (2). Longitudinal scale count 24*-25. TRB 7*-8. Predorsal scales 9-14*. Gill rakers on outer face of first arch 3+1+6(1), rakers very small and thin; rakers on inner face of arch somewhat larger, with tiny spines at tips. Lowermost quarter of first gill arch bound by membrane to opercle.

Head and anterior half of body compressed, forming narrow triangle (apex dorsally), body

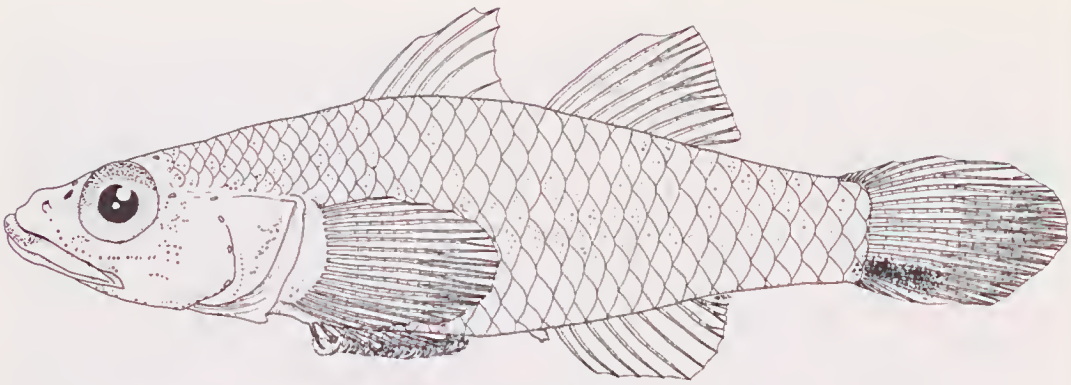


Fig. 7. *Pleurosicya australis* (BPBM 17280), 25 mm female holotype, from Rapa.

compressed posteriorly (Fig. 7). Body depth at anus averages 20% of SL. Body relatively short, mean head length 35% of SL. Head depth about equal to head width. Eyes moderate, 25-30% of HL, set laterally and high on sides of head. Snout pointed in profile, 26% of HL. Mouth terminal, large and oblique, reaching back to below mid-eye (mean jaw length 46% of HL). Interorbital moderate, 5-7% of HL. Nostrils close together; anterior nostril in short tube placed halfway between eye and upper lip, posterior nostril with low rim, close to rim of eye. Tongue large, blunt to slightly concave; specimens may show very slight protuberance at centre of tongue (enhanced when tongue folded inward). Gill opening wide, reaching up to below mid-eye (to posterior half of eye in one).

Dorsal fins short; first dorsal triangular, second dorsal higher than first anteriorly, quite low posteriorly. Anal fin moderate, rounded, posteriormost rays sometimes branched. Caudal fin bluntly rounded. Pectorals reach back to below end of depressed first dorsal. Pelvic fins rounded and cup-like, not reaching anus. Pelvic spine lobes rounded, folded in three largest specimens, and finely fimbriate (as is frenum and outer part of rays). Pelvic rays somewhat flattened near first branch point.

Upper lip narrow, not covering tip of lower jaw when jaws closed. Outermost in upper jaw, six or eight large curved teeth across front (mostly covered by lip); band of very tiny sharp teeth behind this row, band narrows posteriorly, outer teeth at sides larger and more upright. Lower jaw teeth small, sharp, in four or three rows (narrowing to two rows at sides); outermost teeth across front of jaw moveable, angled forward somewhat. Large curved tooth on either side of lower jaw symphysis, behind rows of smaller teeth.

Lateral line canals of head as for genus.

Predorsal scaled up to behind eyes at sides, usually leaving triangular area on mid-line of nape naked. One specimen from Rapa with entire midline naked, slightly larger Rapa specimen has anterior half of nape midline naked.

Male genital papilla short, ovate, with finely fimbriate, expanded tip. Female genital papilla moderate, cylindrical, with two or three small lobes on either side of opening at tip.

Colour in Life. Randall's notes accompanying the 21 mm female read: "Translucent light red; a horizontal red band from snout to eye; blackish spot surrounded by dark red in lower part of caudal fin ... base".

Colour in Alcohol. Head and body pale brownish, with fine melanophores scattered over at least sides of body, and entire body in one specimen (lower half of head and belly unpigmented). Nape immediately behind eyes, top of snout, and lips usually with light scattering of brown pigment. Dorsals, anal, pectorals and pelvics hyaline. Distinct dark brown streak extends from lower caudal base to caudal margin; very little pigment on neighbouring caudal peduncle other than that covering body. Specimen from which Randall took colour notes has fine melanophores roughly following scale outlines on body, especially along mid-side. Diffuse brown stripe from each eye to tip of snout and upper lip, where stripes fuse; lips quite dusky.

Comparisons. This species looks like *P. mossambica*, but has an unpigmented first dorsal, a compressed head with eyes placed laterally (unlike *P. mossambica*'s distinctly

Plate I. a. Live *Luposicya lupus* on the sponge *Phyllospongia foliascens*, from Lizard Island, Queensland. Photo by Neville Coleman. **b.** *Pleurosicya boldinghi* (one of LIAIP 1984172) living on the soft coral *Dendronephthya* sp. at Yokoshima, Ehime, Japan. Photo by Niimura.

triangular (in cross-section) head with dorsolaterally placed eyes), and a brown streak on the lower half of the caudal fin. The mean head width is 53% of HL, versus 64% in *P. mossambica*. Body depth may be slightly greater than that of *P. mossambica*.

Remarks. The lack of material available for this species probably reflects collecting effort, as its known distribution appears to be restricted to a few isolated islands in French Polynesia, an area which has not been well-sampled by collectors.

Etymology. The species name is taken from the Latin *australis* meaning "southern"; the Tubuai Island group (which includes Rapa) is also known as the Austral Islands.

Pleurosicya bilobata (Koumans)
(Figs 8-9)

Cottogobius bilobatus Koumans, 1941:253-254 (India); Koumans 1953:174-176 (India, Nicobar Islands, Celebes, Sulu Islands); Menon and Rao 1971:344 (Malikudu Island); Yoshino and Nishijima 1981:44 (Sesoko Island, Okinawa).

Pleurosycia taisnei Plessis and Fourmanoir, 1966:764-765 (Isle of Pines, New Caledonia).

Pleurosicya bilobatus - Larson and Hoese 1980:33-34 (Guam, Moluccas, Palau); Akihito, Hayashi and Yoshino, in Masuda *et al.* 1984:283 (Okinawa).

Type material. LECTOTYPE - USNM 203588: 19 mm SL male, Muthivaratu Paar, India, S.L. Hora, February 1911. PARALECTOTYPES - ZSI F.5451/2: 21 mm SL male, R.I.M.S. *Investigator* Station 615. ZSI 5452/2: 8.5 mm juvenile, R.I.M.S. *Investigator* Station 623. RMNH 16937: 22.5 mm male, Nicobar Islands, Expedition Harbour, west side near entrance, R.I.M.S. *Investigator* Station 627. HOLOTYPE of *Pleurosicya taisnei* - MNHN 1966-735: 16 mm SL male, Isle of Pines, New Caledonia, 30 m, from ascidian *Polycarpa aurata*, M.Taisne, August 1961.

Additional material. CARGADOS CARAJOS SHOALS - USNM 264920: 3(16-17.5), just NE of Siren Island, 17-21 m, V. Springer, 12 April 1976. INDONESIA - AMS I.18469-150: 17 mm SL male, Ceram, Marsegoe Bay, J. Paxton, 1 April 1975. PAPUA NEW GUINEA - USNM 260953: 22 mm male, Daru, W side of Daru Wharf, 0-10 m, T. Roberts, 10 October 1975; USNM unregistered: Bootless Bay, Motupore Island, 0-1.8 m, B. Collette, 9 June 1979. ZMUC P.781660: 22.5 mm SL female, Bismarck Archipelago, N Manus Island, Lobahan village, in mangroves, Noona Dan Sta.48a, 19 June 1962. AMS I.17092-012: 18 mm SL female, Trobriand Islands, Kiriwinna Island, bay behind Kiriwinna Hotel, 0-1 m, B. Collette, 6 June 1970. AUSTRALIA, NEW SOUTH WALES - AMS unregistered: 16 mm SL female, Parsley Bay, Sydney Harbour, probably from *Halophila*, R. Kuiter, 15 February 1976. MARIANAS, GUAM - CAS 36861: 21 mm SL male, mudflats between Merizo village and Mamaon Channel, H.A.Fehlmann, 12 January 1959. UGM 5779, 15 mm female, Inarajan Pool, in *Enhalus* beds, R. Sanders, 29 December 1971. UGM 5778: 15 mm female, Inarajan Pool, in *Enhalus* beds, R.Sanders, 26 December 1971; UGM 5780, 6(12-19.5), 1/2 mile S of Inarajan village, *Enhalus* beds, 2 January 1972. MICRONESIA, PALAU - CAS 36869: 16.5 mm SL female, Koror Island, W end, R. Harry, F. Bayer, H.A. Fehlmann, 8 July 1955. CAS 36864: 15 mm SL female, Babelthuap Island, by rocks between sea and mangrove swamp, Sumang, 3 November 1959. CAS 36892 - Babelthuap Island, reef pool N of Toagel midpassage, H.A. Fehlmann and Sumang, 23 June 1958. JAPAN - URM P.3573: 9(14-20), Okinawa, Onnason, on seagrass, H. Senou and K. Hatooka, 20 July 1982. URM P.3572: 5(13-16.5), same data as previous.

Diagnosis. An elongate *Pleurosicya* with 16-19 pectoral rays, second dorsal rays usually I,8; anal rays I,8-9. Lateral scales 23-29, TRB 5-7. Nape unscaled. Tongue usually bilobed, and wide gill opening reaching to at least below edge of eye. Body with narrow brown bands, head with diverging stripes, and in males, a characteristic black blotch posteriorly on the soft dorsal fin. Commensal on seagrasses such as *Enhalus*.

Description. An asterisk indicates counts of lectotype. Based on 31 specimens, 8.5 - 23 mm SL. First dorsal VI(31)*. Second dorsal I,7(2); I,8(29)*. Anal I,7(2); I,8(25)*; I,9(4). Pectoral rays 16(12)*, 17(11), 18(5), 19(1). Lowermost 3-7 pectoral rays unbranched and thickened distally. Branched caudal rays 10(1), 11(3). No predorsal scales. Longitudinal scale count 23-29, with a mean of 24*. TRB 5-7, with a mean of 6*. Gill rakers on first arch very low, smooth; 1+1+4(1), 1+1+5(1),

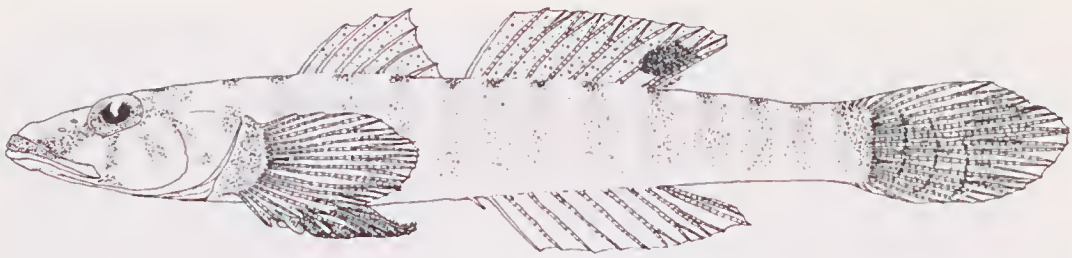


Fig. 8. *Pleurosicya bilobata* (CAS 36861), 22 mm SL male, from Guam (scales, sensory papillae and headpores omitted).

2+1+5(2). Rakers on inner face of arch with fine spines. Lowermost one-third of first gill arch bound by membrane to opercle.

Head and anterior half of body roughly triangular (apex dorsally), posterior half of body compressed. Body slender, body depth at anus averages 15% of SL (Fig. 8). Head length 26 - 36% of SL. Head width greater than head depth. Snout moderately long, 25-37% of HL. Mouth terminal, jaws ending approximately at a point below mid-eye. Eyes moderate, averaging 25% of HL, set dorso-laterally, and forming part of dorsal profile. Interorbital narrow, 3-8% of HL. Anterior nostril in tube, posterior nostril opening almost flush with skin surface. Tongue usually bilobed (blunt in 4, trilobed in 2). Gill opening wide, reaching from below posterior half of eye to not quite reaching eye (usually reaches posterior edge of eye).

Dorsal and anal fins quite low, first dorsal roughly triangular in shape. All anal rays usually unbranched except last, especially in Japanese material; other specimens may have last three or four rays branched at tips. Pectoral fins short, usually reaching back to below end of first dorsal at most. Pelvic fins round, short, not reaching anus. Pelvic spines curved inward. Frenum and lobes around pelvic spines somewhat thickened, lobes usually not greatly expanded and folded. Frenum, pelvic lobes, and inner edge of pelvic cup often finely fimbriate.

Upper jaw with band of small fine teeth, with outermost row of large curved teeth on anterior half of jaw (several of which may protrude from below lip). Lower jaw with an innermost irregular band of small fine teeth, and behind these, one or two large curved teeth on either side of lower jaw symphysis. Outermost row of slender slightly-curved teeth present, across anterior half of lower jaw; these teeth may angle outward somewhat.

Lateral line canals on head as for genus. Occasionally canals all open, with no distinct pores. Sensory papillae as in Figure 9.

Scales absent from head and nape, and not extending further forward than above pectoral base at most.

Male genital papilla flat, usually rather broad, and widest at base. Tip with several tiny lobes. Female papilla rounded and short, with several short lobes at tip.

Colour in Life. No detailed colour notes available. Living specimens translucent green to yellowish green, with brown to golden brown bands and markings on head and body. Eyes are marbled gold. Males with distinct black blotch on end of soft dorsal (blotch absent in females). A freshly-dead specimen is shown in colour in Masuda *et al.*, 1984 (Plate 255, J).

The Sydney Harbour specimen did not show any bars when live. It was noted as being translucent, the body surface covered evenly in red, black and (fewer) iridescent light blue chromatophores. Both dorsal fins were clear, with several red spots on each ray. The iris was red, with eyeball golden.

Colour in Alcohol. Most specimens have the anterior half of body pale, with about 12 narrow brownish bars across back and sides present. The first bar is mostly dorsal, just

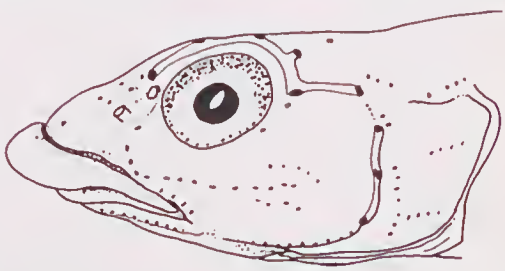


Fig. 9. Sensory papillae and lateral canals of *Pleurosicya bilobata* (URM P.3573), 18.5 mm SL male from Okinawa.

behind pectoral base and often only represented by a blotch (as may be second bar, at first dorsal origin). Bars most distinct on caudal peduncle. Body posterior to pectoral fin may be evenly dusky brown, with the 12 narrow bars across back and sides sometimes visible on upper half of body only. Head pale or light dusky, with three broad stripes from eye across sides of head. Rearmost stripe diffuse, crossing preopercle. Centre stripe more distinct, sometimes quite dark, extending from eye to end of jaws. Anteriormost stripe darkest, runs from eye below nostrils, to tip of lips and snout, but failing to meet counterpart at tip of lip. Entire upper lip may be dusky. Midline of nape above opercular margin with blotch (resembling body bar), which may be diffuse and dusky or distinct and nearly black. Pectoral base sometimes with brown diffuse bar, and upper corner of opercle sometimes with distinct brown blotch.

Both dorsal fins evenly dusky to lightly speckled, with distinct small brown to blackish blotches along their bases which correspond with body bars. Males with blackish elongate blotch on rear of soft dorsal, blotch lying between and partly over the last two rays. Caudal fin clear to dusky, with about four irregular (may form blotches) bands across centre and lower half of fin. Anal and pectorals clear to dusky. Pelvics translucent.

Comparisons. *Pleurosicya bilobata* is quite distinctive in form and colour pattern, especially when live or freshly-preserved. It superficially resembles *P. mossambica*, but is distinguished by its bilobed tongue, long snout, naked nape, relatively long caudal peduncle, specificity of host organism, and colour pattern.

Remarks. As Larson and Hoese (1980) pointed out, Koumans based his description of *Cottogobius bilobatus* on material consisting of two species, without specifying a holotype. Larson and Hoese (1980) designated a specimen from Muthivaratu Paar (USNM 203588) as lectotype. Menon and Rao (1971) refer to a specimen in the Zoological Survey of India's collection as being the holotype of *Cottogobius bilobatus* Koumans, giving the specimen's locality as "Malikudu Island (in small brackish salt water pools)", and also list five paratypes from the same locality. Koumans did not refer to any material from Malikudu Island in his description of *C. bilobatus*, therefore the specimens referred to by Menon and Rao cannot be types. A short-bodied paralectotype (ZSI F.5450/2) of *C. bilobatus* may be *Pleurosicya coerulea* (in poor condition).

This species is commensal on seagrasses (usually broad-leaved types such as *Enhalus*). It clings to the leaf blades, and may seek refuge at the base of the plant. If pursued, *P. bilobata* tends to dart from one leaf to another. Fourmanoir (1966) reports that *P. taisuei* was collected from an ascidian, *Polycarpa aurata*, from 30 m depth. This is the only definite record of the species living on an organism other than seagrass. From my examination of the type, and from Fourmanoir's colour description, his species is the same as *P. bilobata*. Yoshino and Nishijima (1981) record *P. bilobata* as being found on "*Sarcophyton* spp.", but their record of this species is apparently confused with specimens of *P. muscarum* (which does live on *Sarcophyton*), as they give *P. bilobata* the common name of "umitake-haze", which is the common name for *P. muscarum* (*P. bilobata*'s Japanese common name is "umishobu-haze", "umishobu" meaning a kind of seagrass, "haze" meaning goby). The single specimen collected in Sydney Harbour (from *Halophila*) is the only record of this species known so far from Australia; however, seagrass habitats in northern Australia have not been widely sampled, and the species may be more widespread.

Pleurosicya bilobata does not use the seagrass as food, but as a platform for obtaining it. This species has a short gut and pointed teeth, and it picks small crustaceans such as copepods from the leaf blades, or as they float past in the current.

Pleurosicya boldinghi Weber
(Figs 10-13; Pl. 1b)

Pleurosicya Boldinghi Weber, 1913:456-457 (New Guinea).

Pleurosicya boldinghi - Fowler 1928:402 (West New Guinea); Koumans 1953:237-238 (West New Guinea); Larson and Hoese 1980:34-36 (off the coast of Somalia, West New Guinea).

Type material. LECTOTYPE - ZMA 100.209: 26 mm SL male, West New Guinea, 32 m, "Siboga" station 164, 20 August 1899.

Additional material: EAST AFRICA - ZMH 6142: 27.5 female, off coast of Somalia, 55-65 m, "Meteor" station 123, 28 December 1964. ZMH 6153: 2(17-27), off coast of

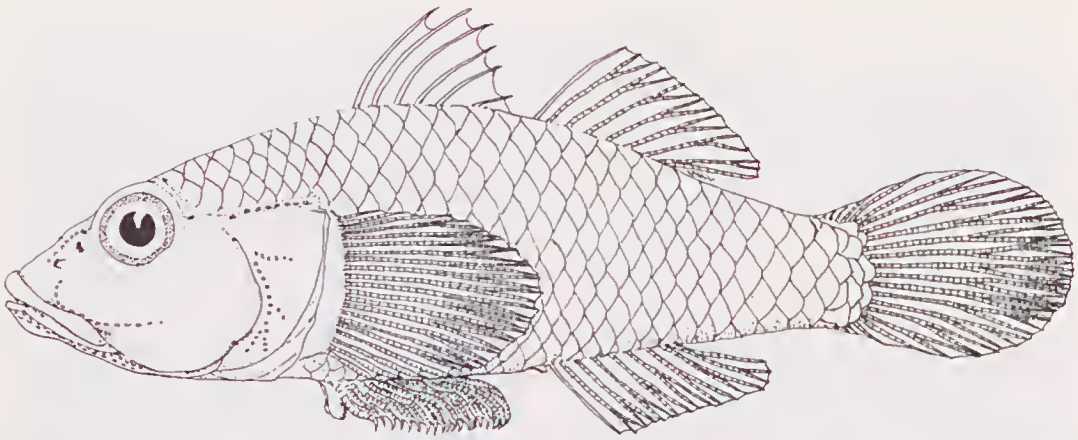


Fig. 10. *Pleurosicya boldinghi* (ZMH 6142), 27.5 mm female, from Somalia coast (scalation based on lectotype).

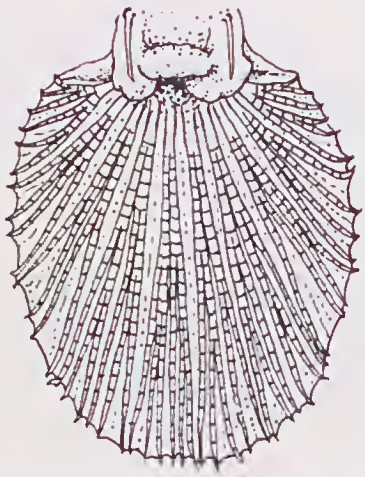


Fig. 11. Pelvic fin structure of *Pleurosicya boldinghi* (ZMH 6142).

Somalia, 41-71 m, "Meteor" station 122, 28 December 1964. NTM S.12659-01: 23 mm female. Kenya, Mombasa, about 2 km off Ras Iwetine, about 127 m, trawled, R. Lubbock, 9 May 1974. WESTERN AUSTRALIA - AMS I.24799-002: 2(11-16), 80 nautical miles NNE of Port Hedland, 82 m, FRV "Soela", beam trawl, 23 October 1983. CSIRO H.2261-01: 17 mm male, 19° 29.6' S, 118° 52.2' E, 38-39 m, FRV "Soela", beam trawl, 30 August 1983. PAPUA NEW GUINEA - NTM S.12242-001: 12 mm female, Port Moresby, Horseshoe Bay, from seapen, 45 m, P.Colin, 16 April 1987. JAPAN - LIAIP 1984172: 4(21.5-27), Shikoku, Uwa Sea, Yokoshima Island, 24 m, Mr Niimura, 8 October 1984. NTM S.11789-001: 5(13.5-27.5), Shikoku Island, Uwa Sea, near Yokoshima Island, 30 m, from large white *Dendronephthya* sp., H. Larson, 11 July 1985. URM P.8285: 21 mm female, Honshu, Izu Peninsula, Izu Oceanic Park, on *Dendronephthya* sp., 35 m, Mr. Ono, 1983. NTM S.12092-001: 11 mm juvenile, Shikoku, Uwa Sea, Shirahama Bay, off *Dendronephthya* sp., 35 m, H.Larson, 10 July 1985.

Diagnosis. Robust goby with relatively small eyes set high on sides of head. Second dorsal rays 1,7; anal rays 1,8. Pectoral rays usually 20. Lateral scales 23, TRB 9. Nape scaled, usually to behind eyes. Gill opening wide, reaching to at least below posterior edge of eye. Tongue blunt. Live colour white, with pale pink markings on head, and no black blotches anywhere. Commensal on soft corals (*Dendronephthya*).

Description. An asterisk indicates counts of lectotype. Based on 19 specimens, 11-27.5 mm SL. First dorsal fin VI(18)*, VII(1). Second dorsal 1,7(19)*. Anal 1,6 (1); 1,7(1): I,8(17)*. Pectoral rays 18(1), 19(2), 20(12)*, 21(4). Lowermost 2-6 pectoral rays unbranched and thickened distally. Branched caudal rays 12(2). 13(2); caudal of lectotype broken. Predorsal scales 5-18 (10 in lectotype). Longitudinal scale count 22-25, with a mean of 23 (25 in lectotype). TRB 7-10*, with a mean of 9. Gill rakers on outer face of first arch low, rounded bumps; 1 + 1 + 3(2), 2 + 1 + 3(1), 2 + 1 + 4(1). Rakers on inner faces of arches more pointed, with tiny spines. Lowermost quarter to one half of first gill arch bound by membrane to operele.

Fig. 12. A, Lateral view of teeth and jaws of *Pleurosicya boldinghi* (NTM S.11789-001), 28 mm SL male from Uwa Sea, Shikoku. B, Ventral view of upper jaw of same specimen.

Head and anterior half of body compressed or roughly triangular in cross-section (apex dorsally), posterior half of body compressed. Body stocky, body depth at anus 17-26% of SL (Fig. 10). Head length 30-41% of SL. Head depth approximately equal to head width, although mean depth is greater than mean width (as in lectotype). Snout moderate, averaging 31% of HL. Mouth terminal, slightly oblique, with jaws ending at point below anterior third of eye; jaw length 37-50% of HL. Eyes appear small, 20-29% of head length (mean 25%), set laterally, high on head, with a low supraorbital ridge present. Interorbital rather wide, 7-15% of head length (mean 10%). Anterior nostril in short tube, posterior nostril with low rim. Tongue blunt, occasionally weakly trilobed. Gill opening wide, reaching to at least posterior edge of eye in 6 specimens, nearly reaching eye in 6, and extending halfway between eye and preopercular edge in 7.

Fins low, first dorsal triangular in shape, caudal truncate to rounded. Anal rays variable, may be all branched, first two rays unbranched, or all unbranched. Pectoral fins reach back to below gap between dorsals. Pelvic fins rounded to oval, not reaching anus, fin rays branched many times, and rather flattened near first branch point (Fig. 11). Frenum and pelvic spine lobes thickened, fleshy and sometimes folded.

Both jaws with fine pointed teeth arranged in narrow bands (two to four rows), and a pair of large curved teeth behind lower jaw symphysis (Fig. 12A and B). Anterior half of upper jaw with outermost row of widely-spaced, large curved teeth. Anterior half of lower jaw with outermost band of small fine straight teeth. Outermost row or two of this band usually moveable, and may be directed upward or outward.

Lateral line canals on head as for genus. Sensory papillae as in Figure 13.

Scales extend up to behind eyes, with 5-18 rows predorsally (Fig. 5). Nape midline partly naked in some specimens (nape completely naked in 11 mm SL specimen), with scales extending forward on either side of nape midline to behind eyes.

Male genital papilla elongate, with several tiny lobes at slightly expanded tip. Female papilla short, thickened, and rounded, with group of tiny lobes across top.

Colour in Life. Body and fins translucent white, fins often transparent (Pl. 1b). Eye silver, overlaid with pink or orange marbling. Narrow red line extends from each eye to tip of upper lip, but lines do not meet. No black markings anywhere. One Japanese specimen had lower half of body light orange-pink, colour darker and more orange anteriorly. Pink colouration extended onto lower half of caudal fin. Edges of both dorsals outlined with faint dusky pigment. Eyes dark orange and snout stripe very pronounced. Two smaller Japanese fish had lower half of body light pink.

Colour in Alcohol. Preserved specimens show no colour pattern at all.

Comparisons. This species resembles *P. annandalei* in general body shape, having a scaled predorsal, wide gill opening, and high pectoral ray counts. It differs from that species (and all others) in having a second dorsal count of I,7, and in colour pattern, with no black or dusky blotches anywhere on fins or body. The usually steep-profiled robust head with small eyes is distinctive. Japanese specimens look generally less stocky than those

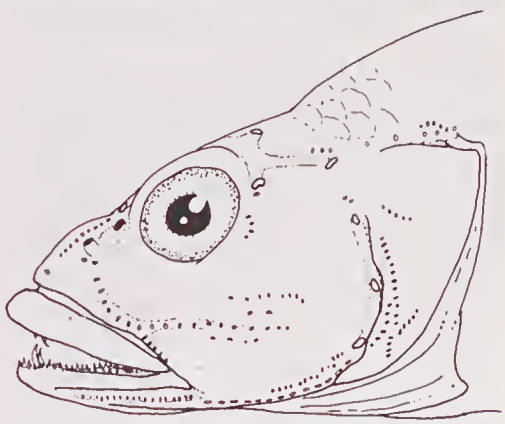


Fig. 13. Sensory papillae of 26 mm *Pleurosicya boldinghi* (one of LIAIP 1984172).

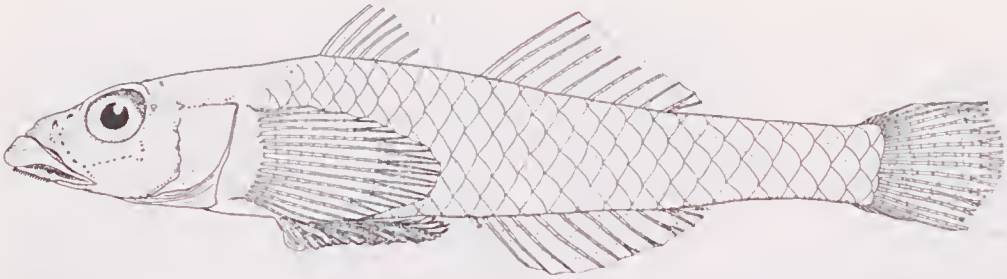


Fig. 14. Holotype of *Pleurosicya carolinensis* (CAS 36875), 25.5 mm male, from Palau. Fins partly reconstructed.

from other localities (body depth at anus averaging 20.6% of SL versus 23.5% of SL).

Remarks. *Pleurosicya boldinghi* was discussed by Larson and Hoese (1980), who also designated the lectotype. At that time, the invertebrate host was unknown for the species. Specimens since collected in Japan have been observed living on very large *Dendronephthya* (white with magenta polyps) of an unknown species, which grow at 20-40 m depths. One specimen from Port Moresby was collected from an unidentified species of sea pen. As most other specimens known have been trawled, the preferred host for these is still unknown.

Pleurosicya carolinensis sp. nov.
(Figs 14-15)

Type material. HOLOTYPE - CAS 36875: 25.5 mm SL male, reef flat in Iwayama Bay, S shore of island 11, Palau, Western Caroline Islands, H.A.Fehlmann & party, 28 August 1955. PARATYPES - CAS 36874: 18.5 mm SL male, Federated States Of Micronesia, Western Carolinc Islands, Palau, Babelthuap Island, Ngarehelong Peninsula, stream into lagoon at foot of Oktol Pier, H.A. Fehlmann and party, 22 August 1955. CAS 36873: 2(19.5-20), Micronesia, Western Caroline Islands, Palau, Auluptagel Island, Iwayama Bay, in cove formed by W arm of Kogai-hento, H.A. Fehlmann and party, 28 July 1955. AMS I.29785-001: 2(14.5-17.5), Micronesia, Western Caroline Islands, Palau, E part Koror Island, small bay on W side Arappu Point in Iwayama Bay, H.A. Fehlmann and party, 23 July 1955. CAS 36868: 19 mm SL male, Micronesia, Western Caroline Islands, Palau, W end Koror island, sand flat enclosed by retaining wall parallel to Malakal Causeway, H.A. Fehlmann and party, 8 July 1955. USNM 306882: 2(15.5-19), Micronesia, Western Caroline Islands, Palau, N tip of Auluptagel Island and Malakal Causeway, H.A. Fehlmann and party, 7 November 1957. CAS 36871: 20 mm SL male, Micronesia, Western Caroline Islands, Palau, Auluptagel Island, Iwayama Bay, in Geruherugairu Pass, between Kaibakku Island and Kogai-hento, H.A. Fehlmann and party, 22 July 1955. ANSP 165111: 5(17-22), same data as holotype. CAS 36858: 2(11-18.5), Micronesia, Western Caroline Islands, Yap, point jutting out into pass from Tomil Bay NW of Donitsch Island, H.A. Fehlmann and party, 4 July 1956. CAS 36860: 10(11.5-19.5), Micronesia, Western Caroline Islands, Yap, reef flat on W side Tarang Island, about 1 mile SW of Tomil Point, Sumang and party, 12 January 1960.

Diagnosis. An elongate *Pleurosicya* with distinctive triangular lower jaw, an enlarged curved tooth at each side of lower jaw, and row of downward-pointing teeth across front, and outside of, lower jaw. Soft dorsal and anal rays usually I,8. Pectoral rays 14-15. Lateral scales 25, TRB 7. Nape naked. Pelvic spines lobes flattened and thin, and sometimes quite small. Gill opening restricted to pectoral base. Tongue blunt to rounded. Known only from Palau and Yap in the Western Caroline Islands, and possibly associated with seagrass.

Description. An asterisk indicates counts of holotype. Based on 24 specimens, 11 to 25.5 mm SL. First dorsal fin VI (23)*, VII (1). Second dorsal fin I,8 (18)*; I,9 (3). Anal fin I,8 (19)*; I,9 (1). Pectoral fin rays 14 (7), 15 (15)*, 16 (2). Lowermost 2-5 (mean 3, 4 in holotype) pectoral rays unbranched, occasionally thickened distally. Branched caudal rays 11, tips of rays broken in most material. Nape naked. Lateral scale count 23 - 27 (mean 25, 24 in holotype). TRB 6 - 8 (mean 7*). Gill rakers on outer face of first arch very low pointed stubs, 2+1+3 (1), 2+1+4 (2). Rakers on inner faces of arches longer, with spines at

tips. Lowermost quarter to third of first gill arch bound to opercle by membrane. Vertebrae 10 + 16 (including urostyle).

Head and anterior half of body rounded to roughly triangular in cross-section, compressed posteriorly (Fig. 14). Body elongate, body depth at anus 14-18% of SL (mean 16%)*. Head length 28-32% of SL (mean 30%). Head width always greater than head depth (mean width 58%, mean depth 50%, of HL). Snout medium, averaging 32% of HL, and rather broad from above. Mouth terminal, moderately large, 33-45% of HL. Jaws slightly oblique, ending at a point below anterior half of eye. Eyes medium, averaging 30% of HL, set dorsolaterally, and forming part of profile. Interorbital somewhat narrow, 3-9% of HL (mean 5%). Gill opening restricted to pectoral base. Anterior nostril closer to upper lip than eye, in slender tube, which may be expanded at tip. Posterior nostril in very short tube or with low rim only. Tongue broad, rounded to blunt (somewhat pointed in two specimens).

First dorsal triangular, equal to or greater than body depth. Second dorsal and anal low, rays highest anteriorly. Anal rays usually branched at tips, especially posteriormost few rays (rays often broken). Pectoral fins short, not reaching anus, and just reaching point below sixth dorsal spine base. Caudal truncate, upper rays longer than lower. Pelvics oval to rounded, forming a shallow cup. Pelvic lobes flattened or slightly fleshy, round to pointed in shape, sometimes very reduced and thin (especially in the 10 specimens from Yap). Frenum narrowly folded forward; pelvic spines straight, tips not turned inward. Lobes and rays sometimes finely fimbriate. Fifth pelvic ray branched about six times, rays somewhat flattened near bases of lower branch points.

Teeth at sides of upper jaw pointed, upright, slender, arranged in single regular row, with one or two rows of smaller, fine pointed teeth behind (Fig. 15A). Front of jaw triangular, very small fine teeth arranged in broad band at each side of symphysis. Outside this band, eight to ten large curved teeth across front of jaw, mostly hidden by upper lip. Lower jaw with one or two rows of small, pointed, upright teeth along sides, and broad band of smaller fine teeth across front of jaw, and extending over front edge of jaw. Front of lower jaw expanded outward, with one or two medium-sized strongly curved canines at outermost

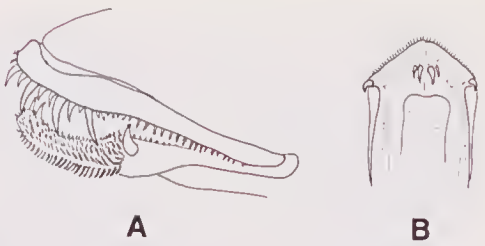


Fig. 15. A, Lateral view of teeth of male *Pleurosicya carolinensis* (CAS 36875), outline of upper lip indicated by dotted line. B, Dorsal view of lower jaw of same specimen, showing expanded sides of jaw by canines.

corners (Fig. 15B). Outermost row in lower jaw is of somewhat blunt, evenly curved, downward and outwardly-pointing teeth; row mostly separated from other teeth, clearly visible from below, and not covered by lips. Lower jaw symphysis raised, with two large curved canines present behind other tooth rows.

Lateral line canals of head as for genus.

Head and nape without scales, as is belly midline.

Male genital papilla slender, thin, narrowing toward tip, which is somewhat expanded and fimbriate. Female genital papilla short, cylindrical, with several slender lobes around opening.

Colour in Life. No information available.

Colour in Alcohol. All available specimens faded. Larger specimens evenly dusted with fine melanophores on sides, top and sides of head, and pectoral base, with pigment absent from breast, underside of head and belly. Occasionally several dusky blotches visible along dorsal midline, most obvious along dorsal bases. In some specimens, upper lip quite dusky, and indistinct dusky stripe present, from eye to tip of snout, and two diverging stripes from anterior interorbit to upper lip. Fins without obvious patterning. Both dorsals and anal covered with fine red-brown speckles, caudal lightly speckled with fine black melanophores. Pectorals with some speckling in some specimens. Pelvics hyaline.

Comparisons. *Pleurosicya carolinensis* can be distinguished from all other *Pleurosicya* by its tooth arrangement and lower jaw shape. This species is similar to *P. elongata* and *P. labiata* in body shape, pelvic fin form, and tooth arrangement (curved tooth at each side of lower jaw), but differs from both these species in that it does not have the tongue reduced, pointed and set back in the throat,

and in having a naked nape (versus scaled or at least partly so). It is similar to *P. fringilla* and *P. prognatha* in possessing a short process on the preopercle reaching toward a slight process on the symplectic (*P. fringilla* and *P. prognatha* have prominent preopercular processes which reach, or nearly reach, a distinct symplectic process).

Remarks. Palau and Yap appear to be the only localities from which this species is known. All the material examined was obtained during the George Vanderbilt Foundation Coral Fish Projects in the Western Carolines from 1955 to 1960. It is not known with what organism this species is commensal; however, most localities from which it was collected were shallow reef areas, often reef flats containing seagrass beds.

The gut is fairly long, and the guts of two specimens contained an amphipod, a few copepods, but were mostly packed with detritus consisting of many broken algal fragments, diatoms (many broken), and much unidentifiable flocculent material. The arrangement of the lower jaw teeth seems suitable for scraping the surface of whatever the fish is sitting on (possibly seagrass blades ?).

Etymology. This species is named for its restricted distribution in the Caroline Islands.

Pleurosicya coerulea sp. nov.
(Fig. 16)

Pleurosicya HKL sp. 5 - Winterbottom and Emery 1986:54 (Eagle Island, Peros Banhos, and Salomon).

Type material. HOLOTYPE - NTM S.12658-001: 16 mm SL male, inter-island reef flat, Japtan Island, Enewetak, Marshall Islands, R. Johannes, May 1971, on *Heliopora coerulea*. PARATYPES - ANSP 165112: 23(8.5-17), Amirantes Islands, off E side D'Arros Island, 15-27 m depth, J. Bohlke and party, 5 March 1964. ROM 58022: 6(10.5-15.5), Chagos Archipelago, Great Chagos Bank, off N tip Eagle Island, 16 m, R. Winterbottom et al., 26 February 1979. ROM 58023: 9(11.5-15.5), Chagos Archipelago, Peros Banhos Atoll, lagoon side of Isle Mapua, 3-7 m, A. Emery et al., 6 March 1979. NTM S.12298-001: 2(14-17), Ashmore Reef, Territory of Australia, lagoon anchorage near West Islet, 10 m depth, off *Heliopora coerulea*, H. Larson, 14 September 1987. WAM P.29048-007: 11 mm SL female, Ashmore Reef, Territory of Australia, 12-13 m depth, G. Allen, T. Knight. WAM P.28025-044, 36(9-16), Rowley Shoals, Western Australia, Clerke Reef, lagoon rim 1.5 km S of Bedwell Island, 1-2 m depth, G. Allen, R. Steene, 6 August 1983. AMS I.21318-058: 3(12-16), Western Australia, Scott Reef, South Lagoon, F. Talbot, 21 September 1979. USNM 209600: 27(7-17), Indonesia, Maluku, Haruku Island, point E of Tandjung Naira, in surge channel, 5 m depth, V. Springer, M. Gomon, 15 January 1973. URM P.11549: 4(15-20), Ryukyu Islands, Japan, Iriomote-jima, Shi-raho, off *Heliopora coerulea*, H. Senou, 28 April 1985. URM P.7518: 2(10.5-15), Ryukyu Islands, Japan, Iriomote-jima, Ohara, off *Heliopora coerulea*, H. Senou and Mr Toma, 30 June 1983. AMS I.20757-073: 2(12-14.5), Great Barrier Reef, Queensland, Escape Reef, AMS party. NTM S.12657-001, 15(7-15.5), Guam, near (Amantes?) Point, on *Heliopora coerulea*, R. Johannes, August 1971. USNM 306884: 13(12.5-18), Marshall Islands, Bikini Atoll, halfway between Bikini and Amen Islands, V. Brock and party, 21 July 1947. NTM S.12658-002: 4(15-15.5), same data as holotype. USNM 306883: 16.5 mm SL male, Marshall Islands, Rongelap Atoll, N end Kieshiechi Island, lagoon coral heads, 6 m depth, V. Brock and E. Herald, 24 July 1946. CAS 36853: 3(17-17.5), Marshall Islands, Kapingamarangi, Thoka-taman, coral head in centre of lagoon W of Hukuhenua Islet, R. Harry, 12 July 1954. AMS I.18045-033: 16(14.5-16), Kiribati, Abaiang Atoll, lagoon side of Teirio Islet, 1-2 m, D. Hoese and B. Goldman, 7 November 1973.

Additional material. ASHMORE REEF - NTM S.12328-053: 2(12-13), N of West Island, reef outside lagoon, 19-20 m depth, off *Heliopora*, H. Larson, 24 September 1987 (both heavily parasitised by copepods).

Diagnosis. A small *Pleurosicya* with broad head and snout, and eyes set dorsolaterally. Second dorsal and anal rays 1,8. Pectoral rays 15-18. Lateral scales 23, TRB 6. Nape naked. Pelvic fins rounded, cup-like, with fleshy, rounded pelvic spine lobes. Tongue round to rather pointed. Gill opening restricted to pectoral base, or only slightly forward. Gill membranes often form a fold over isthmus. Live colour translucent bluish to blue-green, with two reddish stripes on head, and dusky spot on nape midline. Commensal only on the blue coral *Heliopora coerulea*.

Description. An asterisk indicates counts and proportions of holotype. Based on 63

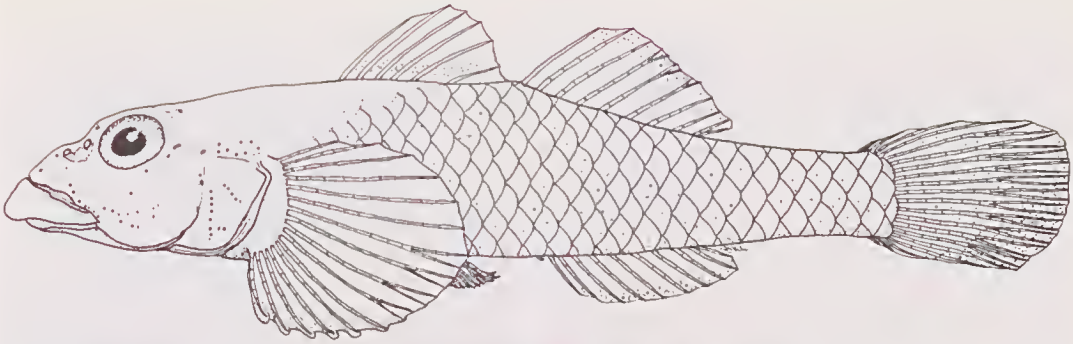


Fig. 16. Holotype of *Pleurosicya coerulea* (NTM S.12658-001), 16 mm male from Enewetak (first dorsal fin reconstructed).

specimens, 10.5 - 20 mm SL. First dorsal fin VI (56)*. Second dorsal I,7(1); I,8(55)*; I,9(2). Anal fin I,8(57)*; I,9(1). Pectoral rays 15(1), 16(7)*, 17(36), 18(18). Lowermost 4-7 (mean 5, 6 in holotype) pectoral rays unbranched, at least tips (often half of ray) thickened distally. Branched caudal rays 11(5)*. Lateral scale count 22-25 (mean 23, 24 in holotype). TRB 5-7* (mean 6). Nape naked. Gill rakers on outer face of first arch 2+1+2 (1), 2+1+3 (1), 3+1+3 (1); rakers very tiny, first three to four rakers with fine spines at tips. Half, or nearly half, of lower limb of first arch bound to inner face of opercle by membrane.

Head and anterior half of body roughly triangular in cross-section (apex dorsally), posterior half of body compressed (Fig. 16). Body short, BDA 14.5-26% of SL (mean 17%). Head length 29-36% of SL (mean 32.5%). Head rather broad, width always greater than depth, cheeks sometimes expanded (mean HW 72% of HL, mean HD 55%). Snout moderate, rounded when viewed from above, averaging 35% of HL. Mouth straight, sub-terminal, jaws ending at point below anterior half of eye. Large upper lip overhangs mouth, especially anteriorly, concealing triangular lower jaw when mouth closed. Lower lip very narrow; near rictus, lip may have small rounded horizontal flap at each side. Eyes moderate, 24-43% of HL (mean 29%). Eyes set dorsolaterally, high on head. Interorbital narrow, 2-6.5% of HL (mean 4%). Anterior nostril in short tube, posterior nostril in shorter tube or low rim. Nostrils very close to upper edge of eye. Tongue rounded to slightly pointed (weakly trilobed in one specimen). Gill opening restricted to pectoral base (in 44), or forward to under opercle (in 15). Gill membranes usually form fold across isthmus (just below level of preopercular edge), but are broadly joined to isthmus.

Fins low, first dorsal shorter than anterior rays of second dorsal. Anal rays unbranched. Caudal roughly rounded, upper rays longer than lower. Pectoral fins rounded, reach to below gap between dorsals. Pelvic fins round, cup-like, may just reach anus; fin rays broad and somewhat flattened near first branch point. Frenum and pelvic spine lobes fleshy and fimbriate, lobes rounded.

Upper jaw teeth very small, fine, and pointed; arranged in narrow band, broader anteriorly, narrowing at sides. Across front of upper jaw and mostly concealed by upper lip, eight to twelve enlarged, slender, curved teeth present. Lower jaw with band of very small, fine, pointed teeth across front; band extends over edge of jaw, so that outermost (sometimes slightly enlarged and curved) row of moveable teeth angle downward and outward. Innermost, an even row of upright, pointed teeth; and one or two large curved canine teeth at each side of jaw symphysis.

Lateral line canals as for genus. In three specimens, anterior interorbital pore paired; in one specimen pore absent.

Nape naked, scales on body extend up to just above pectoral base; naked strip below first dorsal fin. Belly midline naked; one specimen with several scales on belly just before anus.

Male genital papilla moderately long, flattened, with several tiny lobes at expanded, sometimes fimbriate, tip. Female genital papilla short, cylindrical to slightly flattened, with several small lobes on either side of tip.

Colour in Life. No colour notes available for living specimens. Freshly dead fish are translucent dull blue, with scale margins

slightly darker, and body covered with scattered pinkish to light brown speckles. Head and anterior half of abdominal cavity brighter blue than rest of body. Red brown stripe extends from each eye across snout to upper lip, stripes do not meet on lip. Iris silvery, with purple pigment dorsally. Unpaired fins covered with fine pinkish speckles (speckles on caudal fin darkest, nearly red); margins of dorsals, anal, caudal, and lowermost part of pectoral fins dusky, and anal fin rays outlined with dusky pigment.

Colour in Alcohol. Head and body generally pale, covered with fine black or brown melanophores. Melanophores generally absent from strip along bases of dorsals and posterior part of nape midline. Anterior half of nape, pectoral base and sides of body darkest, sides of head and snout usually lighter (pigment intensity variable). No trace of red snout stripes remain. Centre of nape sometimes with elongate diffuse blackish or brownish spot, darker than surrounding pigment. Belly and underside of head unpigmented.

Narrow brown streak on first dorsal fin, just above base. Free edge of first dorsal sometimes with narrow dusky margin. Second dorsal fin with broken brown line just above base of fin (line not always present); dusky margin sometimes present, usually more intense posteriorly; fin rays, especially anteriorly, may be dusky. Caudal fin with faint dusky band on rear edge, darkest dorsally. Pectorals and pelvics clear.

Comparisons. *Pleurosicya coerulea* is most like *P. muscarum* in general body form, but is distinguished by physiognomy (usually convex snout and terminal mouth in *P. muscarum* compared to *P. coerulea*'s overhanging upper jaw and usually flatter snout), mean eye size (29% of HL in *P. coerulea* and 25% in *P. muscarum*), colour pattern (five pairs of red lines on the head of *P. muscarum*, and only one pair of brown lines for *P. coerulea*), and host preference. It is also very close to *P. occidentalis* and is sympatric with this species at the Chagos Archipelago (see description of *P. occidentalis* for further distinguishing features).

Remarks. This species is commensal (parasite?) only upon the blue coral *Heliopora coerulea*, of the Order Helioporacea (i.e. not a true coral). The gut contents of five specimens were examined, as it was suspected that this species might feed upon its host's mucus and epibiota. Three of the five guts were filled with clumps of white flocculent mucus; embedded within this were many diatoms, fine algal filaments, sponge spicules, tiny copepods, and a small amount of material which looked like yellowish plastic food wrap. The remaining two guts were filled with sheets of this "gladwrap" folded many times, and included mucus, diatoms, small copepods, sponge spicules, and algal fragments. The "gladwrap" has been identified as the cuticle or periderm of the *Heliopora*, a structure fairly recently described (Bouillon and Houvenaghel-Crevecoeur 1970). So it would appear that *Pleurosicya coerulea* feeds upon its host directly, as well as obtaining shelter from it. The downward and outwardly-angled lower jaw teeth, though moveable, must be firm enough to dislodge the cuticle from the colony surface.

Etymology. The species name is derived from the Latin *coerulea* (blue), using an older spelling (nowadays *caerulea* is used) to echo the species name of the invertebrate host.

Pleurosicya elongata sp. nov.
(Fig. 17; Pl. IIa)

Type material. HOLOTYPE - NTM S.12654-001: 29 mm SL male, Bootless Bay, Buna Motu, Motupore Island, Port Moresby, Papua New Guinea, 10 m depth, off yellow sponge *Ianthella basta*, P. Colin, 15 September 1986. PARATYPES - NTM S.12310-001: 14.5 female, Ashmore Reef, E side of entrance to West Pass, 20 m depth, from yellow *Ianthella basta*, H. Larson, 18 September 1987. NTM S.12307-019: 2(15.5-16), Ashmore Reef, dropoff at entrance of West Pass, 18-20 m depth, host unknown, H. Larson, 16 September 1987. USNM 210068: 2(18-20), Indonesia, Maluku, Saparua, off Kampungmahu, 14-16 m depth, V. Springer & M. Gomon, 17 January 1973. NTM S.12654-002: 4(13.5-26), Papua New Guinea, same data as holotype. NTM S.12655-001: 8(13-28.5), same data as holotype but from different sponge specimen. WAM P.30053-001: 2(17.5-26.5), Papua New Guinea, Buna Motu, Motupore Island, Port Moresby, 12 m depth, from purple *Ianthella basta*, P. Colin, 14 September 1986. ROM 58024: 3(20.5-25.5), same data as holotype, but from different sponge specimen. AMS I.29786-001: 2(17-21.5), same data as holotype but different sponge specimen. NTM S.12656-001: 3(14-25), reef slope, Papua New

Fig. 17. Holotype of *Pleurosicya elongata* (NTM S.12654-001), 29 mm SL male.

Guinea, Lion Island, Port Moresby, 15 m depth, off fan-shaped sponges, P. Colin, 6 August 1986. AMS I.29888-001: 26.5 mm SL male, Papua New Guinea, Milne Bay. AMS I.22580-029, 21.5 mm SL male, Great Barrier Reef, Queensland, North Escape Reef, back reef, 37 m depth, AMS party, 28 October 1981.

Additional material. ZMUC unregistered: Mortensen Sta.40, 4(17-22), N of Doe Roe, Kei Islands, ca. 25 m depth, trawled from sand substrate, 25 April 1922 (in poor condition).

Diagnosis. A large *Pleurosicya* with long body and snout, and distinctive colour pattern. Dorsal and anal rays usually I,8. Pectoral rays 15-17, usually 16. Lateral scales 25, TRB 8. Sides of nape scaled, scales rarely cross nape midline. Gill opening restricted to pectoral base. Tongue reduced, pointed, set far back in throat. Live colour translucent, matching colour of host, with dark internal markings along vertebral column and below dorsal midline, and brown stripe around snout. Commensal on the fan sponge *Ianthella basta*.

Description. An asterisk indicates counts of holotype. Based on 27 specimens, 13-29 mm SL. First dorsal VI (27)*. Second dorsal I,8 (25)*; I,9 (2). Anal I,6 (1); I,7 (1), I,8 (23)*, I,9 (2). Pectoral rays 15 (5)*, 16 (16), 17 (6). Lowermost 4-7 (mean 6) pectoral rays unbranched, often somewhat thickened distally. Branched caudal rays 11 (8)*. Sides of nape scaled, usually more scales present in larger specimens; midline naked (a few scales across midline of holotype, which is the largest specimen known). Lateral scale count 23-27, with mean of 25*. TRB 7-9, with mean of 8*. Gill rakers on outer face of first arch small, slender, 1+1+5 (1), 1+1+6 (1), 2+1+5 (3); rakers on inner faces of arches slender, with distinct tiny spines at tips. At least lowermost quarter of first arch bound by membrane to opercle.

Head and anterior half of body a rounded triangle in cross-section (apex dorsally), posterior half of body quite compressed (Fig. 17). Body slender, body depth at anus 12-16% of SL (mean 14%). Head length 26-33% of SL (mean 29%). Head width greater than head depth (mean width 50%, and mean depth 57%, of HL). Snout relatively long, 25-52% of HL (mean 35%). Mouth moderate (30-41% of HL), terminal, parallel to body axis. Upper jaw slightly longer than lower, tip of upper lip fleshy. Lower jaw roughly rectangular. Jaws end below a point just in front of anterior edge of eye. Eyes relatively small, 24-36% of HL (mean of 30%), set dorsolaterally, forming part of profile. Interorbital narrow, 1-6% of HL (mean 3%). Anterior nostrils in short tube, posterior nostrils usually with low rim, which may be absent. Tongue narrow, pointed, set back in throat. Gill opening restricted to pectoral base.

First dorsal fin triangular, slightly shorter than anterior rays of second dorsal (about equal to BDA). Anal rays all unbranched. Caudal fin truncate to rounded, upper rays usually longest. Pectoral fins slightly pointed, reaching back to above anus. Pelvic fins oval to round, not reaching anus, forming shallow cup. Pelvic spine lobes flattened but fleshy, rounded, pointed or square in shape. Frenum long, with shallow fold at tips of pelvic spines. Pelvic rays not fleshy or fimbriate at tips, divided many times but not very flattened at first branch point.

Teeth at sides of upper jaw stout, backwardly-curved, arranged in single even row. On either side of upper jaw symphysis, a band of fine pointed upright teeth, with a large curved canine tooth where band meets single row at side. Outermost, at least one other slightly smaller canine at each side of symphysis. Teeth on sides of lower jaw similar to those of upper: backwardly - curved, sharp, in single even row, this row continues behind teeth across front of lower jaw. Front of jaw with band of straight sharp fine teeth at either side of symphysis, band angled outward across

front of jaw in larger specimens. At side where tooth band ends, an enlarged stout curved canine present, sometimes angled outward. An upright canine usually at either side of lower jaw symphysis in males. Females may have reduced, only one, or no lower jaw symphyseal canines.

Lateral line canals of head as for genus.

Body fully scaled, sides of head with scales extending forward to preopercle in large specimens, rest of head naked, as is breast and midline of belly. Holotype (largest specimen) with about 10 rows of scales on nape, scales cross nape midline (all other specimens with midline naked).

Male genital papilla small, narrow, slender, with expanded fimbriate tip (base of papilla may be pigmented). Female genital papilla short, rounded to rather flattened, with about three small lobes on either side of opening at tip.

Colour in Life. Colour description based mostly on slides of living specimens from Port Moresby, kindly provided by Pat Colin of Florida State University.

Head and body translucent pale green, yellow green, or purplish pink, depending on colour of host sponge (Pl. IIa). Scales on upper body with margins finely outlined with brown, lower half of body with very fine sprinkling of melanophores. Peritoneum silvery, with three oblong dark brown internal blotches across top, and series of smaller markings along its sides. Brain and vertebral column silvery white, with eight or nine internal elongate blotches of brown running along top of vertebral column, beginning at base of skull, with last blotch (on hypural fan) rounded. About eight internal brown blotches in line from rear of peritoneum to about end of anal fin. About 12 to 15 small brown to red - brown spots along dorsal midline of body, marking largely just below skin; spots may be joined (especially those below dorsal spines). Anteriormost two of these spots may form elongated marks on dorsal midline of nape. Two short red brown lines behind each eye on brain surface, lines forming "V", apexes nearly joined at nape midline. Relatively broad red to red brown line runs from front of eye to tip of upper lip, covering top of snout and anterior half of lip. A red to red brown line from rear of eye runs along top of operele to opercular margin. Pupil surrounded by ring of bright orange to golden, rest of eye golden or golden brown. Upper halves of operele and preoperele with indistinct brown short lines and blotches, lower halves evenly spotted with fine brown speckles. Pectoral base with distinct brown spot (which may be double) near base of upper three to 10 rays, rest of base evenly covered with fine brown speckles (area above spot may be without pigment). Both dorsals with transparent membranes, spines and rays brownish to red brown. Anal apparently translucent, with whitish pigment on anteriormost rays. Caudal transparent, lower half of fin may be dusted with fine melanophores. Pectorals and pelvics transparent, rays light reddish or brownish.

A specimen from a yellow sponge was noted as having yellow (not brown) dorsal midline spots. Internal blotches and other dark markings pale reddish brown. Snout above red stripes, opercles, and lower half of pectoral base with yellow green iridescent pigment.

Colour in Alcohol. Brown and red brown markings of live colour generally remain as brown pigment. Head and body mostly fairly densely covered with melanophores, and scale margins on upper half of body (and nape) narrowly outlined with dark brown. Distinct unpigmented patch of skin nearly always present on nape behind eyes; rectangular block of brown pigment overlying brain may show through muscle tissue. Internal colour marks in body not visible, except for blotch on hypural fan. Dorsal midline paler than sides of body, and midline's dark brown spots and blotches are conspicuous, especially elongate marks on nape. Stripes behind and in front of eyes distinct, as is blotch or spot on pectoral base. Row of irregular small spots along midside of body, not always distinguishable from dark colouring of sides. Belly pale, unpigmented. Breast and branchiostegals often dusky, especially in larger specimens. Both dorsals and anal with pale pigment scattered over membranes, with dusky markings along bases of fins. Caudal fin covered with fine dusky melanophores, lower half of fin quite dark in some specimens. Pectoral and pelvic fins with membranes near bases dusky, rest of fins transparent.

Comparisons. This species resembles an elongated *P. labiata* in having similar physiognomy and colouration. It differs in that the nape is less scaled (scales usually extend up to behind eyes in *P. labiata*), the lower jaw is shaped differently (rectangular, and of moder-

ate size, not relatively short and triangular), the body is more slender (BDA 14% versus 17% in *labiata*), the pelvic fin form differs (cup-shaped with small slightly fleshy lobes, not flattened with flat folded lobes), and it prefers fan-shaped sponges (particularly *Ianthella basta*) as hosts (*P. labiata* prefers barrel-shaped sponges). One character that *P. elongata*, *P. labiata*, *P. fringilla* and *P. progiiatha* all share is a similar tongue form (small, slender, and pointed, usually appearing to be anchored at the back of the throat). *Pleurosicya fringilla* and *P. progiiatha* differ from the other two in morphology, host preference (staghorn corals), size, and jaw and teeth structure.

Luposicya lupus also resembles this fish when live, as there are many similarities in body form, colouration and host preference. Both species are sponge-dwellers, but *P. elongata* is found on different sponge species to *L. lupus*, and often at a greater depth. When preserved, they are easily distinguished by the characters given earlier for *L. lupus*.

Remarks. Apart from several specimens which were collected by trawl or rotenone, with hosts not observed, all other specimens of this species have been collected by hand from large fan-shaped sponges. These have been identified as *Ianthella basta* (Pallas, 1766), of the family Ianthellidae, a common sponge which has an Indo-Pacific distribution, and several colour forms. It seems likely that *P. elongata* is restricted to this sponge species.

Etymology. From the Latin *elongata* meaning prolonged, referring to the body length of this species.

Pleurosicya fringilla sp. nov.
(Fig. 18)

Pleurosicya HKL sp. 1 - Winterbottom and Emery 1986:54, Fig. 79 (lagoons at Peros Banhos and Salomon).

Pleurosicya 'sp.1' - Allen and Russell 1986: 99 (Scott and Seringapatam Reefs).

Pleurosicya sp.1 - Hoese, in Smith and Heemstra 1986:801 (Sodwana Bay, South Africa).

Type material. HOLOTYPE - USNM 242091: 15 mm SL male, Fiji, Lau Group, Yanutha Islet, lagoon side of barrier reef, V. Springer, 30 April 1982. PARATYPES - RUSI 9533: 11 mm SL male, South Africa, Sodwana, Zululand, P. Heemstra & party, 2 February 1979. CAS 68075: 2(10-14.5), Seychelles, off S shore Beacon Island, 12-15 m, J.Bohlke and party, 3 February 1964. ANSP 165113: 3(17.5-18), Seychelles SE side Beacon Island, off Port Victoria, R. Rosenblatt and party, 5 February 1964. USNM 306887: 11 mm SL female, Madagascar, Nossi-Be, Pt Fievre, left of centre pier, J. Rudloe, 14 January 1964. ANSP 165114: 2(13.5-15), Seychelles, Mahe area, inner edge of reef just N of Anonyme Island, 0 - 3 m depth, J. Bohlke and party, 2 February 1964. ANSP 165115: 6(9.5-13), Seychelles, S side Praslin Island, just E of St Anne's Bay, 8 m depth, J. Bohlke and party, 22 February 1964. BPBM 16342: 18.5 mm SL female, Mauritius, west coast off Flic en Flac, in cave at 30 m depth, 20 November 1973, J. Randall. ROM 58025, 10(10-14), Chagos Archipelago, Peros Banhos Atoll, lagoon side of Isle Mapua, 3-7 m, A. Emery *et al.*, 6 March 1979. WAM P.27596-001: 2(13-14), Western Australia, Abrolhos Island, lagoon on W side Long Island, G. Allen and N. Cross, 19 April 1982. USNM 306885: 7(10.5-15.5), Fiji, same data as holotype. AMS I.22631-055: 3(12-14.5), Great Barrier Reef, Escape Reef, AMS team. AMS I.29787-001: 2(10-13), Queensland, Lizard Island, N side of South Island, on *Acropora* sp., 3 m, D. Hoese, 7 November 1975. NTM S.12653-001: 2(13.5-14.5), Queensland, Heron Island, P. Young. NTM S.12225-008, 5(11-13), Papua New Guinea, Port Moresby, Motupore Island, 3 m depth, from *Pocillopora eydouxi*, P. Colin, 3 October 1986. USNM 306886: 2(11.5-14.4), Papua New Guinea, along S edge of channel between Pelleluru and Ninigo Groups, V. Springer, 26 October 1978. NTM S.12652-001: 13 mm SL male, American Samoa, Tutuila Island, Taena Bank, 27 m depth, R. Wass, 11 November 1975. AMS I.18051-078: 11(10.5-17), Kiribati, Abaiang Atoll, leeward reef off Bolton Point, 7-11 m, D. Hoese and B. Goldman, 10 November 1973. AMS I.21915-077: 4(11-14), Philippines, Batangas Province, Sombrero Island, 6 m depth, D. Hoese, 24 April 1980. YCM 2760: 1 10.5 mm juvenile, Japan, Ryukyu Islands, mouth of Kabira Bay, Ishigaki-jima, M. Hayashi, April 1976. YCM 1758: 2(11-12), Japan, Ryukyu Islands, Kabira Bay, Ishigaki-jima, M. Hayashi and T.Ito, May 1975.

Additional material. GAMBIER ISLANDS - from BPBM 13593: 12.5 mm SL female, Mangareva, E of Rikitea, patch reef, 3-11 m depth, J. Randall and party, 14 Decem-

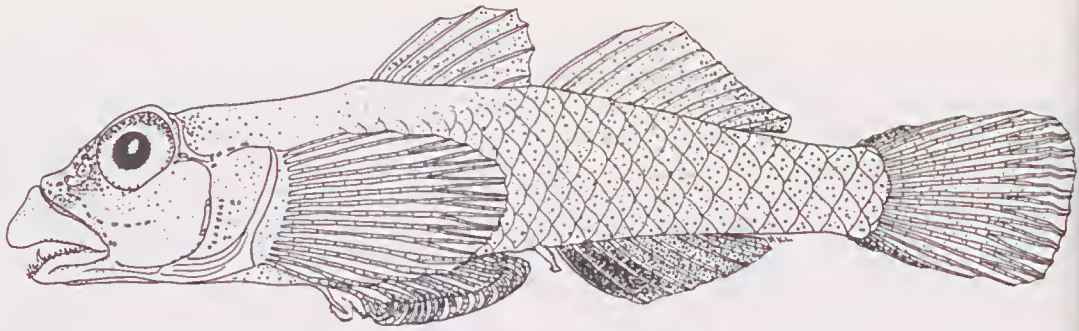


Fig. 18. Holotype of *Pleurosicya fringilla* (USNM 242091). 15 mm SL male from Fiji.

ber 1970. CORAL SEA - WAM P.28541-055: 3(10-12), Holmes Reef, 12-14 m depth, G. Allen, 20 November 1985.

Diagnosis. A small goby with large upper lip, long-snouted appearance, and eyes set relatively high on head. Second dorsal rays 1,8; anal rays 1,8. Pectoral rays 15-16. Lateral scales 27, TRB 8. Body fully scaled, head and nape naked. Gill opening restricted to pectoral base. Tongue small, pointed. Body and unpaired fins usually dusky, distinct black spot present over anterior rays of anal fin in males. Commensal on staghorn corals *Acropora* spp. and *Pocillopora eydouxi*.

Description. An asterisk indicates counts of the holotype. Based on 41 specimens, 10 - 18.5 mm SL. First dorsal fin VI (41)*. Second dorsal 1,7(2); 1,8(37); 1,9(2)*. Anal 1,7(3); 1,8(36)*; 1,9(2). Pectoral rays 14 (4), 15 (24), 16 (13)*. Lowermost 4-6 pectoral rays unbranched, and slightly thickened distally (sometimes no thickening). Branched caudal rays 11 (4)*. Longitudinal scale count 23-31 (24 in holotype), with a mean of 27. TRB 7-10, with a mean of 8*. Gill rakers on outer face of first arch reduced to rudiments; 1+1+1 (1), 1+1+2 (1), 1+1+3 (1), 2+1+4 (1). Lower quarter of first gill arch bound by membrane to opercular wall.

Head and anterior half of body varying from roughly triangular (apex dorsally) to compressed, posterior half of body compressed (Fig. 18). Body sometimes stocky, depth at anus 15-22% of SL (mean 18%). Head length 34% of SL. Head depth may be equal to head width, width usually slightly greater (as in holotype). Snout rather long and pointed, 28-43% of HL, (37% in holotype). Mouth terminal, nearly horizontal, with upper jaw slightly overhanging lower. Jaws end at a point below anterior half of eye. Eye medium in size, 24-35% of HL (mean 29%*). Eyes set laterally, high on head and forming part of the dorsal profile. Interorbital very narrow, 2*-5% of HL (mean of 3%). Nostrils close to front of eye, anterior nostril in slender tube, posterior nostril with low rim. Tongue usually narrow, pointed, occasionally rounded. Gill opening restricted to pectoral base.

First dorsal low and rounded; unpaired fins rounded, including caudal. Second dorsal and anal fin rays all unbranched. Pectoral fins reach back to below tips of first dorsal spines, or nearly so, when depressed. Pelvic fins cup-like, rounded, reaching past anus but not to anal fin origin. Pelvic rays multi-branched, flattened near first branch point. Pelvic spine lobes small, rounded to pointed. Lobes, folded frenum and outermost two-thirds of pelvic fins may be finely fimbriate.

Upper lip usually rather pointed, sometimes broad and fleshy, tending to overhang front of lower jaw. Upper jaw roughly square to pointed, teeth very small, even, pointed, arranged in broad band, widest anteriorly. Outermost, one or two larger curved pointed teeth present at sides of front of upper jaw (hidden by lip). Teeth of lower jaw small, even, pointed, in broad band, widest anteriorly. Outermost teeth at front of jaw often slightly longer, may form separate row, and are moveable. Behind tooth band and widely set on either side of symphysis, are one or two large curved canine teeth.

Lateral line canals of head generally as for genus. Usually only two preopercular pores present, as in holotype (only one specimen with three pores on each preoperele).

Scales on body extend up to behind pectorals, leaving head and nape naked. In smaller specimens, scales do not reach upward to first dorsal or anterior half of second dorsal bases.

Male genital papilla somewhat elongated, broad at base, flattened, with slightly ex-

panded fimbriate tip (some specimens with papilla broad and relatively short). Female genital papilla short and rounded, with several small lobes at tip.

Colour in Life. A specimen collected from a brown staghorn *Acropora* at Lizard Island was transparent, with fine brown speckles over the entire peritoneum, the dorsal surface of which was silvery white and the rest yellowish (underneath the melanophores). A brown stripe ran from front of each eye to tip of snout, where it met its fellow from the other eye. Behind the eyes was yellowish orange, and indistinct brownish areas over the upper opercle. A brown stripe extended forward from origin of dorsal along nape midline to fade into the yellow colouring behind the eyes, and yellowish orange internal pigment was present below the stripe. Eyes silvery to golden. When observed in the field, this species appears translucent, with body colour matching the colour of the *Acropora* upon which it lives.

Colour in Alcohol. Body and posterior half of head evenly covered with light brown melanophores; belly, breast, and underside of head unpigmented. Interorbit, snout and suborbital region pale, with indistinct brown stripe from eye to tip of snout, meeting at middle of upper lip. Lower lip, and remainder of upper lip, unpigmented. Some specimens with top of snout from interorbit to lip dusky, which sometimes forms a distinct brown median stripe. Both dorsal fins transparent, with evenly scattered fine black melanophores present. Anal fin usually darker than dorsals, and in males the membrane between the first two or three rays is black (or darker than rest of fin), forming a distinct blotch. Caudal light brown. Pectorals and pelvics unpigmented, translucent.

Comparisons. This species resembles Goren's *P. proguatha*, and has been confused with that species. *Pleurosicya fringilla* differs in that it does not have an elongated upper jaw and lip forming a "beak", has a black blotch on the anterior rays of the anal fin in males, reaches a size of at least 18 mm SL (versus 15 mm SL), and is more common (in collections). *Pleurosicya fringilla* is also similar to *P. spongicola*, which has higher pectoral ray counts, broad round tongue, steep head profile, and is so far known to be commensal on a sponge from trawl-depths.

Remarks. This species occurs where there are thick stands of large staghorn *Acropora* corals, particularly *A. formosa* and *A. grandis*. *Pleurosicya fringilla* may be observed clinging to the underside of the *Acropora* branches; it will dart further into the thicket of branches if pursued. The species is sympatric with *P. proguatha*, but it is not known if both species live on the same coral colony together (which is likely, given the size of the colonies, and the behaviour of the group).

Both *P. prognatha* and *P. fringilla* share an osteological character which most other *Pleurosicya* examined do not possess: they have a somewhat bifurcate process on the preopercle reaching towards a process on the symplectic (*P. carolinensis* has a short preopercular process reaching toward a very small process on the symplectic).

Etymology. The species name comes from the Latin *fringilla*, meaning chaffinch (a finch), referring to the tiny bird-like appearance of this fish.

Pleurosicya labiata (Weber)
(Figs 19-20)

Rhinogobius labiatus Weber, 1913:470-471 (Flores, Indonesia).

(? *Fusigobius*) *labiatus* - Koumans 1953: 148 (Flores).

? *Luposicya lupus* - Yoshino, in Masuda *et al.* 1984:284, plate 255(O) (Kushimoto, Wakayama province).

Type material. SYNTYPE - ZMA 112.904: 18.5 mm SL female, Labuan Badjo (Badjo Bay), Flores, Indonesia, 17-35 m, sand bottom, "Siboga" station 50, 16-18 April 1899.

Additional material. INDONESIA - USNM 210333: reef off Kulur, Saparua, Moluccas, 6 m, V. Springer, M. Gomon, 20 January 1973. USNM 209995: 4(10.5-18), Saparua, off S side Ceram, 4-10m, isolated coral patch by mangrove shore, V. Springer, M. Gomon, 18 January 1973. USNM 306888: 17.5 mm SL female, Run Island, Banda Islands, "Alpha Helix" Moro cruise, 8 July 1979. USNM 210292: NE side of Ambon Island, about 2 km E of Sawa Telu, coral reef, V. Springer and M. Gomon, 8 January 1973. USNM 306889: 2(20.5-22.5), Tallabassi Bay, off NE tip Big Damalawa Islet, Kabaena Island, Sulawesi, vertical reef face and live and dead corals, 2-15 m, V. Springer *et al.*, 24 February 1974. PHILIPPINES - USNM 99579: 19.5 mm SL male, vicinity of Siasi, Sulu Archipelago, F.I.V. *Albatross* station D5147, 16 February 1908. USNM 243419:

19.5 mm SL female, Negros Oriental, Siquijor Island, 1 km W of Larena, 0-30 m, J. Libbey *et al.*, 15 May 1979. ANSP 165116: 25 mm SL female, SE side of Apo Island, 0-30 m. V. Springer and J. Libbey, 6 June 1978. CAS 68076: 20 mm SL male, off Bonbonon Point at S tip Oriental Negros, 0-18.5 m, V. Springer *et al.*, 13 May 1978. USNM 264925: 3(18.5-28), about 2 km W of Siquijor, Siquijor Island, 18.5-30 m, J. Libbey *et al.*, 14 May 1979. SRI LANKA - USNM 306890: 2(17.5-20), Trincomalee, sandy bottom with boulders and coral, 24 m, C.C. Koenig, 2 April 1970. GREAT BARRIER REEF- NTM S.12525-001: 19.5 mm SL female, off barrel sponge (probably *Xestospongia testudinaria*), Pandora Reef, 6 m, H. Larson, 8 Dec. 1980. NTM S.12524-001: 14 mm SL female, off large sponge, Linnet Reef, 6-15 m, D. Hoese, H. Larson, B. Russell, N. Coleman, 22 November 1980. ASHMORE REEF - NTM S.12230-003: 23 mm SL male, off large barrel sponge, reef slope at entrance to West Pass, 21 m, H. Larson, 25 September 1987.

Diagnosis. A long-bodied, robust *Pleurosicya* with small eyes and mouth. Second dorsal and anal rays 1,8. Pectoral rays usually 16. Lateral scales 25, TRB 8-9. Nape fully scaled. Pelvic fins generally flat, not cup-like, with lobes over pelvic spines thin, pointed or multilobed. Gill opening restricted to pectoral base. Tongue small, pointed. Lower jaw triangular, with large curved tooth at each side. Body speckled dark brown, with scales on upper body outlined with darker pigment, and red-brown stripe from eye to snout tip. Commensal with sponges.

Description. An asterisk indicates counts of syntype. Based on 22 specimens, 10.5-28 mm SL. First dorsal fin VI (18)*. Second dorsal fin 1,7(2); 1,8(15)*; 1,9(1). Anal fin I,8(17)*; 1,9(1). Pectoral rays 15(2), 16(14)*, 17(3), 18(1). Lowermost 3-6 (mean 4) pectoral rays unbranched, occasionally with skin at tips thickened distally. Branched caudal rays 13(4). Predorsal scales 9-11*. Longitudinal scale count 24*-27, with a mean of 25. TRB 7-9*, with a mean of 8. Gill rakers on outer face of first arch very reduced, 1+3(1), 2+3(2), longest raker on upper arm of arch. Rakers on inner faces of arches somewhat larger, with few tiny spines at tips. Lowermost third to fourth of first gill arch bound to inner face of opercle by membrane.

Head and anterior half of body triangular in cross-section (apex dorsally), posterior half of body quite compressed. Body rather elongate, body depth at anus 13-20%, averaging about 17% of SL (Fig. 19). Head length 26-31% of SL (mean 29%). Head width equal to or greater than head depth (mean width 60%, and mean depth 55%, of HL). Snout moderate, averaging 33% of HL. Mouth small, terminal, slightly oblique, with upper jaw overhanging lower. Lower jaw triangular, with pointed tip, and sides near large teeth angled outward. Mean jaw length 34% of HL (32-36%). Jaws end at a point below just in front of eye or below posterior nostril. Eyes relatively small, 23-31% of HL (mean of 27%), set dorsolaterally, high on sides of head. Interorbital narrow, 2-8% of HL, mean of 4%. Nostrils low, sometimes in short tubes (anterior nostril always longer), sometimes only with raised rims, particularly posterior nostril. Tongue reduced, pointed, and very short (set back in throat). Gill opening restricted, not reaching further forward than pectoral base.

First dorsal fin triangular. Second dorsal fin about equal in height to first. Anal fin rays

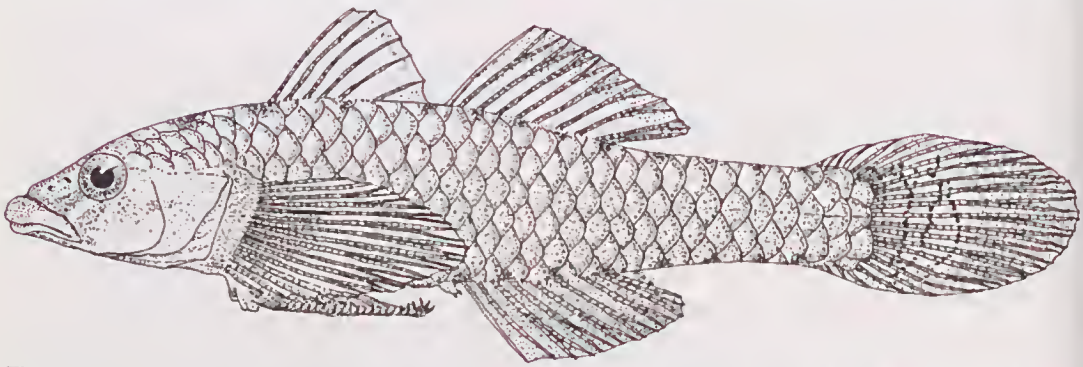
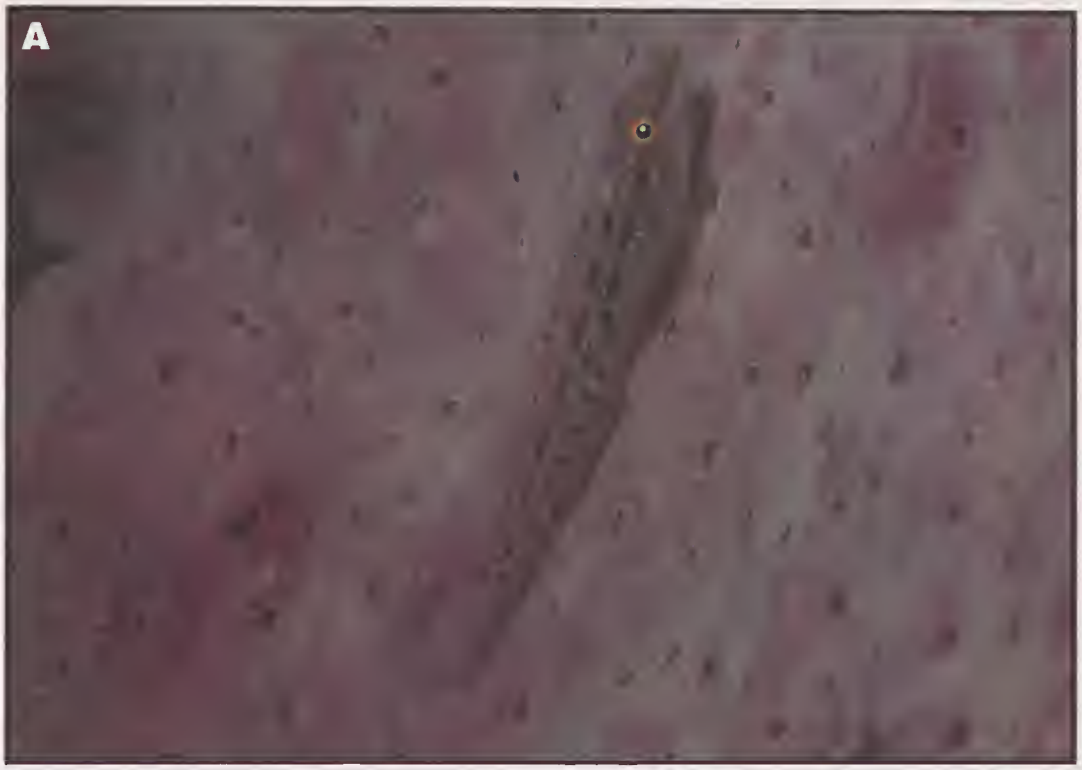


Fig. 19. *Pleurosicya labiata* (USNM 210333), 23 mm SL female, from Saparua, Moluccas (headpores and papillae omitted).



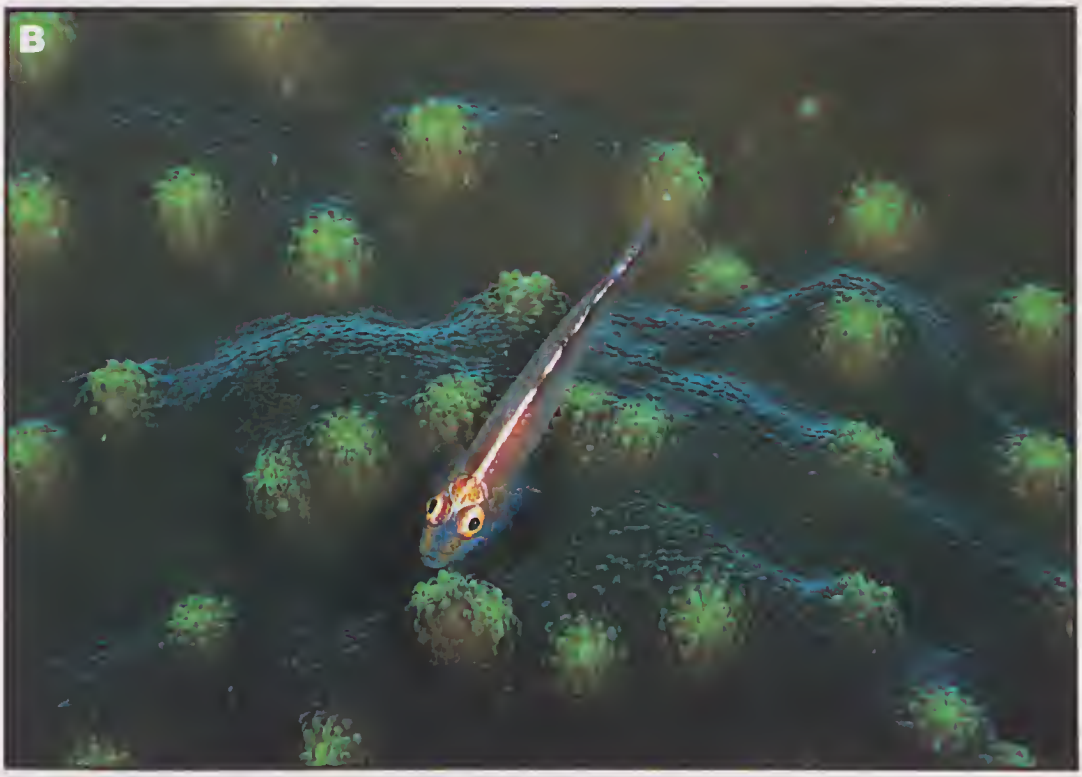


Plate II. a. *Pleurosicya elongata* (AMS I.29786-001) on the sponge *Ianthella basta* at Buna Motu Island, Bootless Bay, New Guinea. Photo by Pat Colin. **b.** Live *Pleurosicya micheli* on the coral *Echinopora* sp., Flores, Indonesia. Photo by Rudie Kuiter.

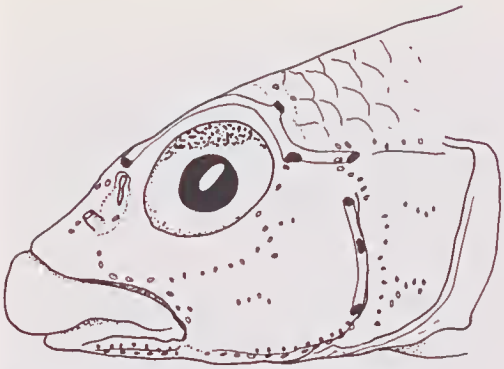


Fig. 20. Sensory papillae of *Pleurosicya labiata* (USNM 210333).

mostly branched. Caudal fin truncate to rounded. Pectoral fins, when flattened, usually reach back to below folded dorsal spine tips. Pelvic fins flattened, not cup-like, with thickened skin present only around pelvic spines and frenum. Pelvic spine lobes flat, not thick or fleshy, may be lobed, folded, pointed, or rounded. Fold in frenum may be quite shallow. Pelvic rays divided many times, but not much flattened near first branch point.

Teeth on sides of jaws small, backwardly curved, and in single row. Teeth across front of upper jaw tiny, straight, pointed, arranged in broad band, with a large curved canine at each side of band. Teeth in lower jaw similar, but most are moveable; innermost somewhat curved and upright, with outermost straight and nearly horizontal. One or two large curved outward-angled canines present on each side of band, and sides of jaw angled outward below these teeth. Large pair of curved teeth behind symphysis of lower jaw.

Lateral line canals on head as for genus. Sensory papillae as in Figure 20.

Head and nape usually fully scaled, with scales extending up to behind eyes, in 9-11 rows. In five specimens the nape midline is naked, with scales extending forward on either side to behind eyes. Belly midline and breast naked.

Genital papilla in male elongate, flattened, wide at base and narrow at tip. Tip with about three tiny lobes present. Female genital papilla short, thick and cylindrical, with two large and several smaller lobes at tip.

Colour in Life. The Ashmore Reef specimen was recorded as being entirely (body and fins) speckled with dark brown, with six internal blocks of yellowish pigment arranged along the vertebral column. The eye was golden brown. A red-brown stripe ran from each eye to snout tip (but did not meet at tip), and two similar stripes began at anterior interorbit, each running to anterior nostril region.

Colour in Alcohol. Head and body evenly covered with melanophores, with most pigment on upper half of body. Scales on upper half of body with edges usually distinctly outlined, forming reticulated pattern. Nape usually with elongate blackish spot on midline, behind eyes. Side of head with broad whitish stripe from eye to rictus and upper jaw; above this is brown stripe from eye to middle of upper jaw (stripe runs just below nostrils). Two indistinct brown stripes extend from interorbit to snout (above nostrils); these stripes not always distinguishable. Lips not heavily pigmented, often pale.

Rays of both dorsals dusky, with some scattered melanophores across membranes. Anal fin light dusky, but rays not heavily pigmented. Pectoral fins dusky basally, and rays often dusky. Pelvic fins usually hyaline to transparent. Caudal fin dusky.

Comparisons. This is a distinctive species, and is closest to *P. elongata* and *P. carolinensis*, the three forming a close-knit group. *Pleurosicya elongata* is most similar to *P. labiata*, but has the lower jaw symphyseal canines either reduced or absent, scales usually present on the sides of the nape only, is commensal on the fan sponge *Ianthella basta*, and is more slender (BDA 14% of SL, versus 17% in *P. labiata*). *Pleurosicya carolinensis* has the nape naked, pectoral rays usually 14, not 16, the tongue rounded, not pointed, and different teeth (outermost row in lower jaw exposed, pointing outward and downward).

Remarks. The species was originally described from two specimens, 22 and 24 mm total length, of which only one remains. The other has not been located (H. Nijssen, personal communication) and is presumed to be lost.

The specimen (which is also apparently lost) illustrated in Masuda *et al.* (1984: Plate 255, O) as *Luposicya lupus* is probably this species. The photograph, counts and description fit *P. labiata*, although the locality is the furthest north known for the species, and the invertebrate host reported (*Junceella juncea*) usually supports *Bryaninops amplus*, not *Pleurosicya* (Larson 1985). *Luposicya* has not yet been found in Japan, but several species of *Pleurosicya* and *Bryaninops* occur there.

Pleurosicya labiata is usually commensal on large barrel-shaped sponges, the Pandora Reef specimen having been identified as probably *Xestospongia testudinaria* (J. Hooper, personal communication).

Pleurosicya micheli Fourmanoir
(Fig. 21; Pl. IIb)

Pleurosycia micheli Fourmanoir, 1971: 499-500, Fig. 8 (Lifou, Loyalty Islands) [type lost].

Pleurosicya HKL sp.15? - Winterbottom and Emery 1986:55 (drop-off at Peros Banhos).

Type material. NEOTYPE - out of AMS I.21918-069: 17.5 mm SL female, Caban Island, Philippines, D. Hoese, 1980.

Additional material. SEYCHELLES - ANSP 165117: 5(8.5-13.5), Amirantes Islands, SW of Ressource Island, 24-30 m, J. Bohlke and party, 7 March 1964. SOUTHERN TAIWAN - NTM S.12160-004: 18 mm SL female, Wang-li-tun, 10 m, K.T. Shao, 1986. NTM S.12160-006: 20 mm SL male, same data as previous. OKINAWA, JAPAN - URM P. 2154: 2(13-15.5), Amurojima, Kerama Islands, 20 m, on *Pachyseris* sp., K. Shimada, 15 July 1980. URM P.2198: 14.5 mm SL male, Gahi, Kerama Islands, 20 m, on *Pachyseris* sp., K. Shimada, 14 July 1980. URM P.2149: 2(15-16.5), Agenashiki, Kerama Islands, 20 m, off *Pachyseris* sp., T. Yoshino, 16 July 1980. PALAU, MICRONESIA - AMS I.17936-001: 16.5 mm SL female, Bairakaseru Island, coral cliff, 38-53 m, G. Allen, W. Starck. PHILIPPINES - AMS I.21918-069: 4(13.5-17.5), Caban Island, D. Hoese, 1980. AMS I.21908-016: 16.5 mm SL female, Sombrero Island, Batangas Province, 1-34 m, D. Hoese and party, 23 April 1980. USNM 264928: 18 mm SL male, Mindanao, Zamboanga del Norte, W side Selinog Island, 21 m, L. Knapp, 3 May 1979. USNM 264918: 6(16.5-20), Negros Oriental, about 2 km W of Siquijor, Siquijor Island, 24-30 m, J. Libbey and party, 14 May 1979. USNM 306891: 17 mm SL male, Palawan, Cuyo Island on W side Cocoro Island, 0-21 m, V. Springer and party, 26 May 1978. HAWAII - BPBM 28712: 12(14-18), off Kona, P. Lobel, March 1982. BPBM 28736: 34(11-17), Ke'ei, Kona coast, on *Porites lobata* heads and ledges beneath, 24 m, P. Lobel and J. Randall, 11 August 1982. NTM S.12651-001: 2(14.5-20), Napoopoo Bay, among corals, 15 m, P. Lobel, 1982. FIJI - USNM 242085: 3(11.5-17), Ono-Ilau, outside barrier reef on NW side of island, 0-42 m, V. Springer and party, 1 May 1982. USNM 242087: 11 mm SL female, Viti Levu, S corner of Toberua Passage entrance, 0-36 m, V. Springer and party, 30 May 1982. USNM 241785: 14.5 mm SL male, NW corner of barrier reef, Navutu Ira Island, Lau Islands, Fiji, rocks and sand, 30-36 m, V. Springer *et al.*, 3 May 1982. TONGA - BPBM 28864: 16.5 mm SL male, Tongatapu, off NW corner Manima Island, 17 m, J. Randall, 9 March 1983.

Diagnosis. A small *Pleurosicya* with wide gill opening and dark stripe along lower half of body and caudal fin. Second dorsal and anal fins I,8. Pectoral rays 16-19. Lateral scales 25, TRB 7-8. Sides of nape scaled up to behind eyes, midline naked. Gill opening wide, at least to below posterior edge of eye. Tongue blunt to weakly trilobed. First dorsal fin may have scattered dusky markings; lower half of body dusky, intensified posteriorly to form blackish stripe on caudal peduncle and fin. Commensal on lobed or foliose hard corals such as *Pachyseris* and *Porites*.

Description. An asterisk indicates counts of neotype. Description based on 34 specimens, 11.5 - 20.5 mm SL. First dorsal fin VI (33)*. Second dorsal I,7 (3); I,8 (31)*. Anal I,7 (2); I,8 (30)*; I,9 (2). Pectoral rays 16 (2), 17 (20), 18 (11)*, 19 (1). Lowermost 2-5 (4 in neotype) pectoral rays unbranched, tips usually thickened distally. Branched caudal rays 11 (4). Scale rows on sides of nape 8-12. Longitudinal scale count 22-28, with mean of 25. TRB 6-9, mean 7. Gill rakers reduced to tiny stumps, on first arch 2+1+5 (3). Lower quarter of first gill arch bound to inner face of opercle by membrane.

Head and anterior half of body triangular (apex dorsally), posterior half of body compressed. Body usually slender, depth at anus 14-21%, mean depth 16% of SL (Fig. 21). Head length averages 33% of SL. Head width always greater than head depth. Snout moderate, rectangular in shape from dorsal view, 21-30% of HL. Mouth terminal, slightly oblique, with narrow lips. Jaws 38-48% of HL, end at point below anterior half of eye or mid-eye. Eyes moderate, placed dorsolaterally on head, 25-35% of HL. Interorbital narrow, 2-5% of

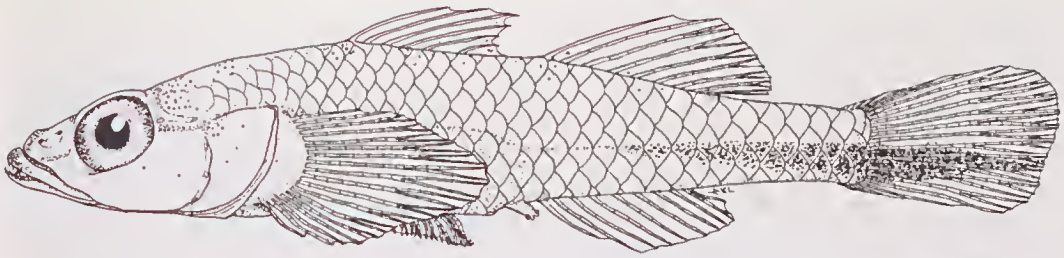


Fig. 21. Neotype of *Pleurosicya micheli* (out of AMS I.21918-069), 17.5 mm female from Caban Island, Philippines. Scales reconstructed, based on average scale counts, and sensory papillae omitted.

HL (mean 4%). Nostrils close together, posterior nostril in low rim, placed close to anterior upper edge of eye, anterior nostril in short tube, placed halfway between edge of eye and upper lip. Tongue blunt to weakly trilobed. Gill opening wide, reaching forward to at least posterior edge of eye.

First dorsal fin low and rounded; second dorsal fin roughly triangular, taller than first dorsal anteriorly, quite low posteriorly. Anal fin rounded, about equal to first dorsal in height; anal rays unbranched. Caudal truncate, upper lobe usually slightly longer than lower. Pectorals reach back to below gap between dorsals. Pelvics round, when flattened reaching to anus; pelvic spine lobes irregular and folded several times, often forming several smaller lobes; lobes finely fimbriate, as may be surface of pelvic cup. Fifth pelvic ray not flattened. Frenum fimbriate, often elongated fimbriate lobe present posteriorly on frenum.

Teeth in upper jaw with band of fine sharp teeth, wide anteriorly, narrowing to two rows at sides, outermost teeth at sides slightly larger than inner; outermost row of larger curved teeth across front of jaw only, largest teeth at end of row. Lower jaw teeth small, sharp, arranged in broad band anteriorly, innermost row becomes single row at sides of jaw (teeth in single row somewhat larger and more upright); outermost teeth at front of jaw very small, usually moveable. Single large curved canine tooth at each side of lower jaw symphysis, behind bands of small teeth.

Lateral line canals as for genus.

Scales on body extend up onto sides of nape in adults, in some specimens scales on head only extend forward to over operele; scales usually reach to eyes or close behind eyes. Nape midline naked; one specimen from Okinawa has two scales at first dorsal origin and rest of nape naked.

Genital papilla in males slender and flattened, with several tiny lobes at barely-expanded tip, often one slightly longer central lobe at rear of tip. Female genital papilla short, rounded, with several, sometimes elongate, lobes around opening at tip.

Colour in Life. Transparent with red or red-brown internal pigment extending over pharynx and upper half of peritoneum, then forms streak which runs just below entire length of vertebral column (Pl. IIb). Brain and vertebral column bright white, silvery white, or silvery pink, with four to six blocks of red colour internally extending from red streak up over white vertebral column (giving it red and white banded appearance). Peritoneum white. Red streak below vertebral column darkens posteriorly to brown. On surface of body, beginning approximately behind abdominal cavity, a brown stripe follows internal streak onto caudal base, and usually extends onto lower half of caudal fin (brown stripe may be very dense, or black, on caudal base itself).

Iris light golden to silver, with broad outer margin of red brown pigment (often dark brown dorsally); bright white or light golden pigment present, either as broad stripe above pupil, or as round spot on upper rear of eye. Surface of brain sometimes with scattered brown or red rounded blotches. Sides of head may be tinged with brown or red pigment. Red or orange stripe extends forward from each eye to snout and upper lip; stripes do not meet. Upper lip dusky, with orange or red pigment where eye-snout stripes end. Base of first dorsal fin with narrow red or brown streak, second dorsal fin tinged with light red, other fins (other than caudal) transparent. Caudal fin with upper half clear, lower half with red brown streak reaching from base to margin. Narrow brown or pink line sometimes visible on dorsal midline, extending from origin of first dorsal fin to caudal base.

Colour in Alcohol. Internal markings no longer visible; fish appear pale with dusky streak extending from midbody along lower sides then onto caudal fin. Streak often quite dark above anal fin base, and on lower lobe of caudal fin, and may form a blackish blotch on caudal base. First dorsal fin sometimes with faint dusky stripe near base, or scattered dusky markings (usually unpigmented). Entire lower lobe of caudal fin may be dark brown, or only light dusky streak present. Stripe from eye to upper lip dusky, usually observable. Some dusky pigment may be visible along lower half of head and body; some specimens with entire body lightly dusted with melanophores, and streak on lower side indistinguishable.

Comparisons. This species is similar to *P. mossambica*, possessing a moderately wide gill opening, and it has the sides of the nape scaled. *Pleurosicya micheli* can be distinguished by its lacking a black blotch on the first dorsal (scattered dusky, not black, markings may be present), in having the nape midline naked (a few scales on midline just in front of first dorsal in one specimen), distinctive live colour, and in using hard corals as host invertebrate. *Pleurosicya mossambica* may sometimes have a dusky stripe along the side of the caudal peduncle, but is a much larger, robust species, and the lateral stripe is more diffuse. It also prefers soft corals and sponges as hosts (just over half the specimens recorded), with only 18% being found on hard corals.

Remarks. The type of *P. micheli* appears to be lost. The holotype was not found at MNHN during a visit there in 1988 and despite Fourmanoir's statement in the original description, the specimen was never deposited at MNHN (Bauchot *et al.* in press). Fourmanoir's brief description and figure greatly resemble the coral-commensal species referred to as *Pleurosicya* sp. 15? in Winterbottom and Emery (1986). Although Fourmanoir's description is short, and does not give the position of the gill opening, his colour description and figure indicate that his *P. micheli* is more than likely the same as the present material. No additional material is known from the Loyalty Islands (the type locality). The neotype was chosen from Philippine material, rather than from Fiji or Tonga (closer to the type locality), because of its size, reasonable condition, and typical colouring.

This species appears to be commensal on hard corals. Fourmanoir's specimen was collected from a coral and alcyonarian substrate. Most specimens are from rotenone stations, and their hosts thus unknown. The Japanese specimens, collected by hand, came from *Pachyseris*, a foliose, plate-like coral. The hand-collected Hawaiian specimens came from *Porites lobata* and small ledges surrounding the coral colonies. Colour slides of living fish in Hawaii, Tonga, Port Moresby, Rabaul, and Flores show the fish perched on *Psammocora*, *Porites*, *Turbinaria*, *Platygyra sinuosa* and *Echinopora* respectively. *Pleurosicya micheli* is relatively conspicuous when live (transparent with banded red and white internal markings) and may be observed perched on corals in a similar manner to the red and white striped tripterygiid *Helcogramma striata*. The obvious colour and behaviour of this species is probably why it is the species of the genus most often photographed.

A copepod parasitising the gill chamber of a specimen from the Philippines was identified as *Pharodes banyulensis* by Dr. Z.Kabata of the Pacific Biological Station, British Columbia.

Pleurosicya mossambica Smith
(Fig. 22; Pl. IIa-b)

Pleurosicya mossambica Smith, 1959:218, Fig. 37 (Baixo Pinda); Allen *et al.* 1976:431 (Lord Howe Island); Goren 1984:72-74, Fig. 1 (Marsa Barecha, southern Sinai Peninsula); Hoese, in Smith and Heemstra 1986:800 (Sodwana Bay, Mozambique, Seychelles, and tropical Indo-West Pacific).

Pleurosicya sinaia Goren, 1984:74-76, Fig. 2 (Marsa Barecha, southern Sinai Peninsula).

Pleurosicya HKL sp. 2 - Winterbottom and Emery 1986:54, Fig. 80 (Peros Banhos and Salomon).

Type material. HOLOTYPE of *Pleurosicya mossambica* - RUSI 227: 18 mm SL male, Baixo Pinda, Mozambique, South Africa, M.M. Smith. HOLOTYPE of *Pleurosicya sinaia* - TAU 6415: 16 mm SL male, Marsa Barecha, southern Sinai Peninsula, M. Goren, 16 October 1979. PARATYPE of *Pleurosicya sinaia* - TAU 6414: 17.5 mm SL male, 15 km S of Eilat, A. Avidor, October 1976.

Additional material. SOUTH AFRICA - RUSI 76-8: 17 mm SL male, reef off Sodwana,

Kwazulu. SEYCHELLES - ANSP 165118: 17 mm SL male, off S shore Faon Island, 12-15 m, R. Rosenblatt and party, 28 January 1964. ANSP 165119: 2(17-20), W of N tip of Anonyme Island, 10.5-15 m, J. Bohlke and party, 11 February 1964. WESTERN AUSTRALIA - WAM P. 30054-001: 22 mm SL female, Monte Bello Islands, near Alpha Island, off *Turbinaria* coral, 3-9 m, H. Larson, 22 April 1983. NTM S.12650-001: 24 mm SL male, from flat sponge, otherwise same data as previous. NTM S.10805-050: 3(16-25), Monte Bello Island, near Alpha Island, on sponges and *Turbinaria* coral, H. Larson and R. Williams, 22 April 1983. NORTHERN TERRITORY - NTM S.10591-005: 17 mm SL male, off E side New Year Island, 10-12 m, from *Nephthya* sp., H. Larson, R. Williams, 14 October 1982. GREAT BARRIER REEF, QUEENSLAND - AMS I.207010-002: 3(20.5-22), One Tree Island, off sponge, D. Hoese, 1972. AMS I.29788-001: 12.5 mm SL female, Lizard Island lagoon entrance channel, off *Sinularia peculiaris*, 2-6 m, H. Larson, 12 December 1978. AMS I.29789-001: 15 mm SL female, Wistari Reef, 15 m, D. Fisk, 20 September 1976. NTM S.12649-001: 2(17-21), Wistari Reef, 10-11 m, off *Lemnalia africana*, H. Larson, 27 October 1978. NTM S.12648-001: 20 mm SL male, off bowl-shaped coral, otherwise same data as previous. AMS DFH 75-444: 21.5 mm SL male, Lizard Island, Mrs Watson's Bay, 4 m, from mantle of *Tridacna gigas*, N. Coleman, 29 November 1975. NTM S.12647-001: 7(12.5-18), Lizard Island, Mrs Watson's Bay, 6 m, off *Millepora* sp., H. Larson, 12 February 1977. AMS I.29790-001: 22 mm SL male, Mrs Watson's Beach, 17 m, off feathery angiosperm, R. Kuiter, 6 November 1975. AMS I.29791-001: 12 mm SL female, Mrs Watson's Beach, 15 m, off alga *Avrainvillea* sp., N.Coleman, 9 November 1975. NTM S.12646-001: 5(18-24), Lizard Island, between South and Palfrey Islands, 5-10m, off *Sinularia flexibilis*, H. Larson, 10 February 1977. NTM S.12645-001: 6(15-21), off *Sinularia* sp., otherwise same data as previous. AMS I.22579-068: 19 mm SL male, Escape Reef North, back reef flat, 1-4 m, 28 October 1981. NEW SOUTH WALES - AMS I.29792-001: 18.5 mm SL female, Sydney Harbour, Parsley Bay, R. Kuiter, on grey sponge, 8 February 1976. AMS I.29794-001: 17 mm SL male, Sydney Harbour, Watson's Bay, R. Kuiter, on orange sponge, 8 February 1976. AMS I.29793-001: 7(10.5-19.5), Sydney Harbour, Parsley Bay, R. Kuiter, on several species of sponge, 15 February 1976. AMS unregistered: JP 77-10: 4(12.5-15), North Solitary Island, H. Larson, 1977. PAPUA NEW GUINEA - NTM S.12228-003: 3(13.5-17), Loloata Island, off Port Moresby, 6 m, P. Colin, off *Millepora* sp., 7 November 1986. FIJI - USNM 260062: 2(17.5-18.5), lee side of South Minerva Reef, 0-24 m, G. Preston and party, 1 October 1982. NEW CALEDONIA - AMS unregistered: 27 mm SL male, "from alcyonarian", Fourmanoir, 14 June 19??. MARSHALL ISLANDS - USNM 306892: 18.5 mm SL male, Bikini Island, in lagoon, K. Emory, 11 May 1946. PHILIPPINES - LIAIP 1983.364: 2(18-19.5), El Nido, western Palawan, H. Masuda, 6-25 March 1983. JAPAN - YCM 9243: 2(13.5-15), Himejima, near Okinoshima Island, Hakata, Kochi Prefecture, 20 m, M. Hayashi, 17 August 1981. YCM 9244: 2(16-17), same data as previous. LIAIP 1984.171: 18 mm SL male, Shirahama, Nishiumi-cho, Ehime Prefecture, 28 m, Mr Niimura, 23 August 1984. LIAIP 1984.173: 13.5 mm female, Kyokojima, Nishiumi-cho, Ehime Prefecture, on red *Dendronephthya* sp., 9 October 1984.

Diagnosis. A robust *Pleurosicya* with black blotch on the first dorsal fin, and scaled nape. Second dorsal and anal rays I,8. Pectoral rays 17-19. Lateral scales 20-27. TRB 6-8. Nape fully scaled to behind eyes, or with nape sides scaled and midline naked. Gill opening wide, to below posterior half of eye. Pelvics round. Tongue usually blunt. Lower half of first dorsal with distinct black blotch or streak; sometimes entire body dusky. Commensal on a wide range of organisms (including plants), chiefly soft corals and sponges.

Description. An asterisk indicates counts of holotype. Based on 67 specimens 10.5-27 mm SL. First dorsal fin V (2), VI(62)*. Second dorsal fin I,6(1); I,7(4); I,8(58)*. Anal fin I,7(1); I,8(60)*; I,9(3). Pectoral rays 16(1), 17(24)*, 18(30), 19(11), 20(1). Lowermost 3-8 (mean 5.4 in holotype) pectoral rays unbranched, thickened distally. Branched caudal rays 11*. Predorsal scales 6-13. Nape scaled up to behind eyes in adults, with 6-13 predorsal scales. Nape midline naked in 43 specimens, midline partly to fully scaled in 20 specimens. Belly in front of anus may be scaled. Longitu-

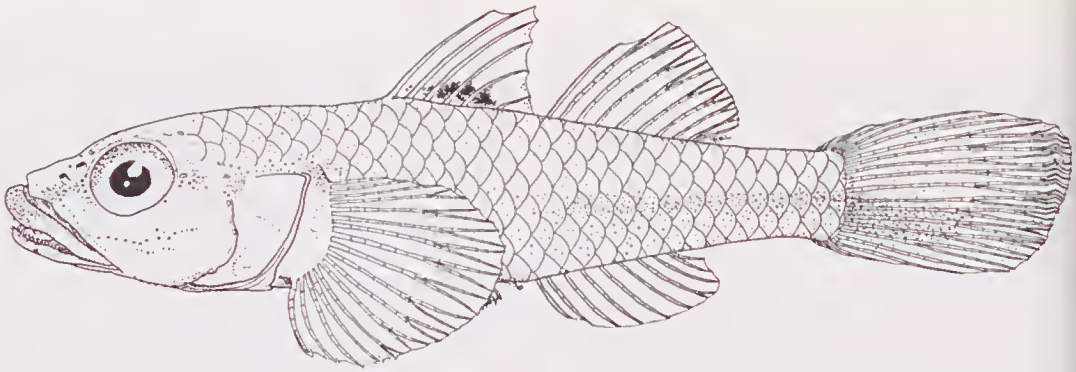


Fig. 22. *Pleurosicya mossambica* (21 mm SL), from Wistari Reef, Queensland, NTM S.12649-001.

dinal scales 20-27 (mean 24, 23 in holotype). TRB 6-8 (mean 7 , 7 in holotype). Gill rakers very short, 1+1+6 (1), 2+1+6 (3). Lowermost quarter or third of first gill arch bound by membrane to inner face of opercle.

Head and anterior half of body triangular, apex dorsally; posterior half of body compressed (Fig. 22). Body usually stocky, BDA 15-19% of SL (mean 17%). Head length 30-38% of SL. Head width nearly always greater than head depth (mean width 64%, and mean depth 55%, of HL). Snout moderate, averaging 28% of HL, rounded to (usually) rectangular from dorsal view, profile rather pointed. Mouth terminal, sometimes barely subterminal, slightly oblique, with jaws ending at point below anterior half of eye; mean jaw length 45% of HL. Eyes moderate, 23-34% of HL, set dorsolaterally high on head. Interorbital relatively narrow, 3-7% of HL. Anterior nostril in short tube, slightly closer to edge of eye than upper lip; posterior nostril with low rim and placed close to edge of eye. Tongue usually blunt, can be slightly trilobed or concave. Gill opening wide, reaching forward to below mid-eye, or at least posterior edge of eye. Two specimens from Japan possess tiny cirri around rear rim of eye (similar to those in some specimens of *P. annandalei*).

Fins low, first dorsal roughly triangular, shorter than anterior rays of second dorsal, which is quite low posteriorly. Anal fin low, rounded; rays either unbranched, or only tips of posteriormost few rays branched. Caudal truncate, upper half slightly longer than lower. Pectoral fins reach back to below gap between dorsals. Pelvics round, cup-like, usually reach anus; rays not broad and flattened before first branch point (rather flattened between first and second branch points). Pelvic spine lobes triangular, each lobe usually divided and folded somewhat; lobes and frenum usually fimbriate.

Outermost in upper jaw, six to eight curved canine teeth across front of jaw only, teeth mostly covered by upper lip and only tips of teeth visible; behind these teeth a band of tiny sharp teeth composed of about five rows, this band narrows to three or two rows at rear sides of jaw. Lower jaw teeth with similar band of tiny sharp teeth, innermost row of teeth slightly larger, more upright than others, and only this row remains at rear sides of jaw; outermost rows across front of jaw moveable, may be oriented nearly horizontally. One or two large curved canine teeth on either side of lower jaw symphysis, behind other rows. Males have larger teeth than females.

Lateral line canals as for genus. Sensory papillae and lateral canals as in Figure 22. In three specimens, anterior interorbital pore close to, and partly fused with, posterior interorbital pore.

Nape scaled up to behind eyes in adults, with 6-13 predorsal scales. Nape midline naked in 43 specimens (including holotype), midline partly to fully scaled in 20 specimens. Belly in front of anus may be scaled in large specimens.

Male genital papilla small, elongate, and flattened, slightly wider at base than towards tip; tip expanded, with several tiny lobes and one somewhat longer lobe at centre rear of tip. Female genital papilla short, rounded, with group of small lobes around opening at tip.

Colour in Life. The colour of this species is variable, and generally depends on host colouration (Pl. IIIa-b). Head and body transparent, or translucent light grey green, pale pink, or dull yellow (depending on basic colour of

host). Brain, vertebral column and peritoneum usually visible, coloured white or light pink or golden. Lower half of head and body with internal reddish or light brown pigment; posterior lower half of body may have reddish stripe on surface, extending toward caudal peduncle. In some (usually transparent) specimens, the vertebral column is evenly blotched with internal red pigment (six or seven small blocks of red), and a red brown diffuse streak extends from behind each eye along body, on either side of vertebral column. Of six specimens off a single *Sinularia* colony, three were generally greenish blue, one grey green, and two dull yellow ochre (all with dusky black spot on base of first dorsal).

Snout and jaws may be yellow, or dusky pink. Distinct pink, red brown, or red stripe extends from each eye to tip of upper lip, each stripe usually meeting its counterpart at lip; upper lip usually pink or red. Two stripes may be present, at upper and lower anterior margins of eye, stripes join by nostrils to form single stripe. Indistinct markings sometimes form a diffuse pink or red-brown stripe from rear of eye across opercle. Top of head behind eyes directly over brain usually with clusters of brown, black or orange spots or blotches (subcutaneous pigment may be yellow or whitish). Iris bright silvery or golden, margin of eye rimmed with red, orange, or brown marbling. Fins transparent; lower half of first dorsal with black blotch or streak. A specimen from New Caledonia was noted as having lower half of first dorsal red, with a black streak from the third to fifth rays, and upper half of fin clear with red margin.

A specimen photographed on a bright orange sponge is not only translucent orange but also densely covered with fine melanophores over head and body (fins plain orange). A large specimen photographed on *Halimeda* sp. at Lizard Island was a nearly opaque yellow (almost lemon yellow), with about eight bright white irregular patches across the back, and on upper pectoral base. The body colour extended onto the lower half of the caudal fin, where the lowermost rays were quite reddish. The irises and eye/snout stripes were orange red (the stripes indistinct). The Sydney Harbour specimens were noted as being quite variable in colour. They were translucent, covered with black and red chromatophores in varying proportions, giving them a pale grey to pink colour. The peritoneum was light yellow, with two to six broad dark orange bands of internal pigment crossing the abdominal cavity. Four specimens from bright orange sponges were translucent pale yellow (internally), covered with black, yellow and orange chromatophores over the body surface. Fins varied from pink to orange, similar to the fish's body colour. Both dorsal fins had about three red blotches along each ray, and the caudal fin showed some red bars.

Colour in Alcohol. The black blotch on the first dorsal fin remains as the most distinctive marking. In some specimens, and in most juveniles, the blotch is very faint or reduced in size. Usually the blotch occupies at least the lower third of the fin, and is most intense between the third and sixth spines. Sometimes the dorsal fin blotch is larger in males than in females; but this is not consistent. Very little may remain of the rest of the colour pattern, as all internal pigment is obscured by the body wall. The snout/eye stripe, irregular dusky markings on the nape, and possibly a diffuse streak along lower caudal peduncle may be all that is visible. The lower half of the caudal fin may be dusky; other fins translucent.

Some specimens are very dark, with dusky pigment arranged evenly over the head and body, and the scale margins are often distinctly outlined. The first dorsal fin blotch is still present, but is not as conspicuous against the dark body (most of these dark specimens come from rotenone stations, so it is not known if the colour is linked to a particular host; the dark brown Northern Territory specimen was collected from a *Nephthea* sp.). Still other specimens may show very little to no black or brown markings on the first dorsal fin, although these fish may have been collected along with others which do show black blotches (these differences cannot be linked to sexual dimorphism with certainty).

Comparisons. The combination of characters such as a wide gill opening, usually fully scaled nape and a black blotch on the first dorsal fin serves to distinguish this species from other *Pleurosicya*, except for *P. annandalei* and *P. micheli*. *Pleurosicya mossambica* and *P. annandalei* are very similar, but can be differentiated by pectoral ray counts, habitat, and nape scalation. These differences are discussed under *P. annandalei*. *Pleurosicya mossambica* differs from *P. micheli* in that *P.*

micheli has the nape midline naked, has no or very little dusky markings on the first dorsal, is generally smaller (largest specimen known so far is 20.5mm SL), distinctive live colour (some specimens of *P. mossambica* may have similar colouring, but with black blotch on first dorsal; if brown streak present on side of body, it is not as prominent as in *P. micheli*), and is usually associated with hard corals (only 20 out of 111 *P. mossambica* collected were from hard corals).

This species not only varies in colour, but shows some variation in physiognomy and scalation. The variation in nape scalation does not seem to depend on sex, commensal host, or geographic region. In a number of cases, several specimens, collected at the same time from the same host, showed considerable variation in scalation (some fully scaled, some with nape midline variably unscaled). Some specimens have the nape naked, but with an isolated patch of scales over the operele (three or four rows of one or two scales).

Physiognomy and proportions are variable. The 12 specimens from New South Wales are particularly variable, both in colour and in head shape. The larger specimens have black markings on the first dorsal fin, whereas the smaller (less than 16 mm) do not. In addition, seven specimens have snouts which are shorter than usually found in the species, and these are round when viewed from above (usually roughly rectangular). A 15 mm female specimen from Wistari Reef has the shortest snout and largest eyes of all *P. mossambica* specimens examined, as well as rather small teeth, and thus does not resemble a typical *P. mossambica*, although it has a scaled nape, wide gill opening, dark markings on the lower part of the first dorsal fin and was commensal on an unidentified gorgonian. A 12.5 mm female from Lizard Island, commensal on *Simularia peculiaris*, closely resembles this specimen in head proportions, as do the female specimens among a batch of seven specimens collected from *Millepora* sp. (the single male being "typical" in proportions, with longer, less rounded snout). Usually, however, males and females have similar head shape and proportions.

Remarks. Goren (1984) described *P. sinaia* as being different from all other *Pleurosicya* in having a low dorsal ray count (I,6, with most *Pleurosicya* having I,8). The holotype of *P. sinaia* has the last (eighth) dorsal soft ray broken close to the base, and must have been overlooked by Goren; so must have the last (eighth) dorsal ray of the paratype, which is undamaged. The paratype is in slightly better condition than the holotype (which has been somewhat squashed sideways). The fish are rather compressed, but otherwise appear to be *P. mossambica*.

This species has the widest distribution and widest range of host organisms of all *Pleurosicya* species. It often occurs on soft corals of the families Alcyoniidae (known from *Lobophytum batarum*, *Sinularia* sp., *S. flexibilis*, *S. peculiaris*, *Sarcophyton crassocaule*, and *S. trocheliophorum*) and Nephtheidae (*Lemnalia africana*, *L. carnosa*, *Lemnalia* sp., *Nephthea chabrolii*, *N. gracillima*, *N. legiopolypa*, and *Nephthea* sp.) and is the only gobiid known to live on nephtheids. In addition, the hydroid *Millepora* sp., the giant bivalve *Tridacna gigas*, the corals *Dendrophyllia* sp. and *Turbinaria* sp., at least four sponge species from Sydney Harbour, several unidentified Great Barrier Reef sponges, the green algae *Caulerpa* sp., *Halimeda* sp., and *Avranvillea* sp., and the angiosperm *Halophila* sp. have all been observed as hosts to *P. mossambica*. Several small juveniles of what are probably *P. mossambica* have been collected from the coral *Parahalomitra* sp., and unidentified holothurians and tunicates from Lizard Island. The Sydney Harbour specimens were collected from four species of sponge (but no record was kept of which fish came from which sponge). The sponges are *Crella incrustans* (family Crellidae), *Spirastrella* sp. (family Spirastrellidae), *Callyspongia* sp. (family Callyspongiidae), and an unidentified sponge of the family Tedaniidae.

Among 111 specimens collected of which the hosts were known, 37 were found on soft corals, 27 on sponges, 20 on stony corals, 12 on *Millepora* sp., and a scattering of specimens on other organisms (five on tunicates, three on *Halophila* sp., two on algae and 1 each on *Tridacna* sp., *Antipatharia* sp., *Isis hippuris*, a holothurian, and an unidentified gorgonian). On a number of these hosts, other gobiids have been present with *P. mossambica* (*Luposicya lupus* on sponges, *Bryaninops erythrops* on *Millepora*, *B. isis* on *Isis hippuris*, and *B. tigris* on *Antipatharia*).

Pleurosicya muscarum (Jordan and Seale)
(Fig. 23)

Rhinogobius muscarum Jordan and Seale, 1906:401 (Pago Pago).

Glossogobius biocellatus (in part) - Schultz 1943:231 (based on syntypes of *Rhinogobius muscarum*).

Pleurosicyops timidus Smith 1959:217 (Baixo Pinda, Mozambique).

Pleurosicya timidus - Hoese and Winterbottom 1979:5 (South Africa).

Pleurosicya muscarum - Wass 1984:28 (American Samoa); Hoese, in Smith and Heemstra 1986:800 (Mozambique, Seychelles).

Pleurosicya sp. - Yoshino, in Masuda *et al.*1984:283-4 (Ryukyu Islands).

Pleurosicya HKL sp.8 - Winterbottom and Emery 1986:54 (Salomon).

Type material. SYNTYPES of *Pleurosicya muscarum* - USNM 51782: 2(11-13), Pago Pago, Samoa. HOLOTYPE of *Pleurosicya timidus* - RUSI 228: 17 mm SL male, Baixo Pinda, Mozambique, J.L.B. Smith, 1956. PARATYPE of *Pleurosicya timidus* - RUSI 696: 18 mm SL female, Baixo Pinda, Mozambique, 10 August 1951.

Additional material. OMAN - ROM 39903: 14.5 mm SL female, Gulf of Oman, Sur, B. Simm, 4 November 1981. SEYCHELLES - ANSP 165120: 19 mm SL male, off S shore Faon Island, 12-15 m depth, J. Tyler and party, 28 January 1964. SOUTH AFRICA - RUSI 76-9: 18 mm SL female, Kwazulu, reef off Sodwana. CHAGOS ARCHIPELAGO - ROM 58026: 15 mm SL male, Great Chagos Bank, in Three Brothers lagoon, 7 m, large patch reef, A. Emery *et al.*, 28 February 1979. ROM 58027: 2(12.5-13), Salomon Atoll, dropoff on E side Isle Poule, 18-25 m, seafans, corals and sponges, A. Emery *et al.*, 22 March 1979. ROM 58028: 16.5 mm SL male, Peros Banhos Atoll, S end of Isle de Bain, 7 m, *Acropora* bommie, R. Winterbottom *et al.*, 6 February 1979. WESTERN AUSTRALIA - NTM S.10814-050: 12 mm SL male, Dampier Archipelago, Rosemary Island, 3-4 m depth, H. Larson and R. Williams, 26 April 1983. GREAT BARRIER REEF, QUEENSLAND - ANSP 165121: 10(13-18.5), Endeavour Reef, 3/4 mile NW of Cook wreck site, 2-5 m depth, J. Tyler and party, 16 January 1969. AMS I.29795-001: 17 mm female, Lizard Island, on *Sinularia flexibilis*, H. Larson. NTM S.11447-016: 11(12-16), Lizard Island, H. Larson, 19 September 1981. AMS I.29796-001: 15.5 mm SL female, Lizard Island, research station beach, off *Lobophytum crassospiculatum*, H. Larson, 3 February 1975. AMS I.22733-003: 9(14-18.5), Lizard Island, Osprey Island, 21 September 1981. AMS unregistered LZ 81-3: 2(16.5-20.5), Turtle Beach, N of Mrs Watson's Bay, off *Sinularia flexibilis*, 4 m depth, H. Larson, 16 September 1981. NTM S.12644-001: 3(15-20), Pandora Reef, 6 m depth, off *Sarcophyton* sp., H. Larson, 8 December 1980. NTM S.12643-001: 2(15.5-21.5), Heron Island, reef flat S of boat channel, off *Cladiella steineri*, 1-2 m depth, H. Larson, 25 October 1978. JAPAN - YCM 12921: 2(13-18), Yaeyama Islands, Aragusuku Island, M. Hayashi, 25 July 1984. YCM 12922: 15 mm SL female, same data as preceding. URM P.8281: 20 mm SL male, Okinawa, Sesoko Island, 2 m depth, on *Sarcophyton* sp., T. Yoshino, 21 August 1974. URM P.10342: 5(10-16), Okinawa, Zampa Cape, off *Lobophytum crassum* ?, 17 November 1984. NTM S.12117-001: 18.5 mm SL male, Iriomote-jima, Sakiyama Bay, on *Sarcophyton* sp., H. Larson, 12 August 1985. URM P.8279: 18 mm SL, Ishigaki-jima, Sukuji, K. Shimada, 26 July 1980. PHILIPPINES - USNM 306894: 3(16-20), Palawan Province, W side Tagauayan Island, 0-14 m depth, USNM team, 25 May 1978. GUAM - CAS 36862: 15.5 mm SL male, Agana Bay, lagoon just N of Alupat Island, A. Fehlmann and party, 26 April 1959. MICRONESIA - NSMT P.22981: 16 mm SL male, Truk, SE coast Moen Island, K. Matsuura, 26 June 1982. CAS 68077: 15 mm SL male, Caroline Islands, Kapingamarangi Atoll, Thokataman, coral head in centre of lagoon W of Hukuhenua Islet, 12 July 1954. USNM 223056: 16 mm SL male, Caroline Islands, Ponape, Nan Madol, 0-2 m depth, V. Springer, 3 September 1980. AMERICAN SAMOA - AMS I.21390-001: 8(12-16), Tutuila, Pago Pago Bay, 2 m depth, off soft coral, R. Wass, 24 May 1979. FIJI - USNM 241704: 5(14-18), Lau Group, Matuku Island, N side of main harbour, 0-1 m depth, V. Springer and party, 23 April 1982.

Diagnosis. A relatively large *Pleurosicya*, with distinctive convex-nosed profile, and pattern of red lines on head when live. Second dorsal and anal rays I,8. Pectoral rays usually 17-18. Lateral scales 23, TRB 6. Head and nape naked. Gill opening to pectoral base,

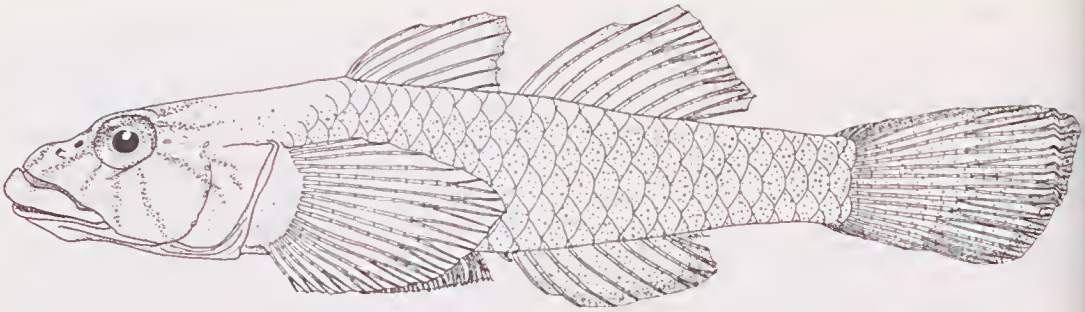


Fig. 23. *Pleurosicya muscarum*, 20.5 mm SL male (AMS unregistered), from Lizard Island, Queensland (papillae omitted). Note deformed anterior first dorsal fin spine.

sometimes slightly further forward. Tongue blunt or rounded. Live colour translucent greyish blue or green, with several thin red lines radiating from eye over sides of head and snout. Commensal only with alcyonarian soft corals.

Description. Based on 45 specimens, 11 - 21.5 mm SL. First dorsal rays VI (45). Second dorsal I,7 (5); I,8 (40). Anal I,7 (4); I,8 (39); I,9 (2). Pectoral rays 16 (1), 17 (21), 18 (16), 19 (7). Lowermost 1-7 pectoral rays unbranched, somewhat thickened distally, as may be lower 3-5 branched rays if number of unbranched rays is low. Fifteen specimens with only one unbranched ray, and six with all unbranched (mean 2). Branched caudal rays 11 (7). Lateral scale count 21-25, with a mean of 23. TRB 5 - 7, mean of 6. Gill rakers on first arch rudimentary stubs, 1+1+4 (1), 2+1+2 (1), 2+1+5 (3). One third to less than one quarter of first arch bound by membrane to opercle.

Head roughly triangular (apex dorsally), 29-36% of SL. Body compressed, especially posteriorly, body depth at anus 14-21% of SL (Fig. 23). Head width always greater than head depth (mean depth 53% of HL, mean width 61% of HL). Snout moderately long, 23-38% of HL (mean of 31%), with convex profile, more pronounced in larger specimens. Mouth large, terminal, slightly oblique, with jaws ending at a point below middle of eye. Upper lip fairly wide, covering teeth of upper jaw, and overhanging tip of lower jaw in some specimens. Eye relatively small, 20-31% of HL (mean of 25%), set high on sides of head. Interorbital narrow, 2-7% of HL (mean 4%). Anterior nostril in short tube, posterior with low rim; both nostrils close to eye. Tongue usually blunt to rounded; weakly trilobed in the paratype of *Pleurosicyops timidus*, and two other specimens. Gill opening restricted to pectoral base, reaching further forward to (or nearly to) preopercular edge in five specimens. Vertebrae of syntypes both 10 + 16.

First dorsal fin triangular, about equal to body depth. Second dorsal with anterior rays highest, taller than first dorsal, posterior rays shorter. Last three to four anal rays may be branched in large specimens. Caudal fin rounded, upper rays somewhat longer than lower. Pectoral fins reach nearly to second dorsal fin origin. Pelvic fins rounded to oval, average 19% of SL, and do not always reach anus. Pelvic spine lobes usually rather narrow, pointed to rounded, fleshy, and may be slightly folded. Lobes and frenum usually finely fimbriate. Fifth pelvic ray broad and flattened near first branch point.

Innermost upper jaw teeth very small, sharp, in single row on sides, and forming moderate band across front of jaw (two to five closely-packed rows). Across front of jaw, an outer row of larger somewhat curved canines, largest teeth towards sides. Lower jaw teeth with innermost row of moderately stout pointed teeth evenly spaced. Two large curved canines present behind lower jaw symphysis, often an additional smaller canine beside each tooth. Outermost teeth very fine, pointed, and moveable, forming a band from middle of side of jaw to symphysis, and sometimes partly covered by mucus. Teeth of females smaller than males, particularly the canines.

Lateral line canals on head as for genus. In some specimens, underside of head and anterior part of breast covered with fine papillae (as described for *Phyllogobius platycephalops* by Larson 1986), which are differentiated from sensory papillae by their smaller size.

Head and nape naked, body scales may not always extend forward over pectoral base.

Male genital papilla of moderate length, flattened, widest at base, tip finely fimbriate. Female genital papilla short, rather rounded, with several small lobes on either side of tip. Females are not as large as males.

Colour in Life. This species was usually recorded (in my notes) as being a transparent bluish to greenish grey, sometimes with yellow snout, and always with at least five pink lines on the head, and one (internal) on each side of peritoneum. The following is the usual arrangement. The posteriormost line on head runs from rear edge of eye along top of operele, but not reaching edge. The next extends from lower rear edge of eye across top of preoperele then diagonally across operele, but does not reach lower angle. The next line, from rear lower edge of eye, extends towards angle of preoperele, but does not quite reach it. The next line forward is from lower edge of eye to corner of mouth. The anteriormost line runs from front of eye to tip of snout, where it bends to join its fellow from the opposite side, and extends somewhat onto upper lip. A short pink line extends from anterior part of interorbit to each nostril, forming a "V". A short pink line sometimes visible behind each eye on temporal region. Internally, the oesophageal area is pink, and a distinct pink line extends from this region to either side of top of peritoneum ending approximately above anus (pink lines visible from above). The margins of both dorsals and anal fins are outlined by dusky black, and the entire caudal is evenly dark grey. The iris is silver or golden. A freshly dead specimen is shown in colour in Masuda *et al.*, 1984 (Plate 255, K).

A Heron Island (Queensland) specimen was noted as being basically similar to the above, with the lines being more red than pink, the iris silver, and all fins pink, with no dusky margin present. It was kept alive in a small container for some time with a second smaller specimen being added later. Upon seeing the smaller fish, the larger fish immediately changed colour: its head became translucent yellow, the lips intensified their pinkish red colouration, and the entire body darkened. Accompanying these colour changes was an aggressive display (the fish inflated its branchiostegal rays, its pectorals were spread wide and vibrated, and it hopped sideways toward the smaller fish).

Colour in Alcohol. When initially preserved, pink or red lines fade to orange or brownish, and body scales (except for lower half of body) may show as outlined in orange. After some time in alcohol, very little trace may remain of red lines.

Body (including belly but not breast in larger fish) evenly covered with melanophores, giving fish a pale brownish appearance, with pale head and dorsal midline. Posterior half of body may be more heavily pigmented than anterior half. Nape, top of head and operele usually dusky, with pale areas interspersed with dusky stripes representing remains of red stripes sometimes present. Tip of snout, upper lip, and sometimes chin, dusky. Preorbital usually without pigmentation. Both dorsals and anal transparent, with distinct dusky margins, and a scattering of melanophores over rest of membranes. Caudal fin dusky; sometimes fairly dark, with melanophores arranged in close-set wavy vertical rows (giving a fine-banded appearance). One very dark specimen from Ponape has dusky streak on caudal fin. Pectoral and pelvic fins generally translucent to hyaline, pectoral fin may have outer part of membrane speckled with melanophores.

Comparisons. This is a fairly distinctive *Pleurosicya*, characterised by a moderately long body, convex snout profile, small eyes set high on head, live colouring, low number of unbranched pectoral rays, and a host distribution restricted to only soft corals. The species is easy to distinguish from *P. mossambica*, which also may inhabit soft corals (the two species may be found in neighbouring corals, but so far they have never been recorded on the same coral). *Pleurosicya mossambica* has a black blotch on the base of the first dorsal, larger and more dorso-laterally placed eyes, wide gill opening, and a scaled nape.

Remarks. *Pleurosicya muscarum* was originally described from six specimens, however, only two syntypes have been found. They are not in good condition and have damaged fins and bodies. Both specimens, especially the male, show the characteristic longish convex-profiled snout and evenly scattered pigmentation on the body, which is illustrated in Jordan and Seale's (1906) figure. Schultz (1943) included *P. muscarum* in his synonymy of *Glossogobius biocellatus*, which was apparently based on his observation of the syntypes' gill openings, which are torn (and thus wide) in both.

This species is commensal only on soft corals of the family Alcyoniidae, preferring species of the genera *Sinularia* and *Lobophytum*. It has been found on *Cladiella steineri* (only at Heron Island, Queensland), *Lobophytum crassospiculatum*, *L. crassum* ?, *L. robustum*, *L. choedei* ?, *Sarcophyton ehrenbergi*, *Sinularia flexibilis*, *S. leptoclados*, *S. polydactyla*, and *S. robusta*. The fish live in small groups among the branches and base of the coral. Unfortunately it is often difficult to collect all specimens from a particular soft coral by hand, since the fish may hide in crevices at the base of the colony, and thus the sex ratios are indeterminate. In addition, males are larger and thus more conspicuous than females (males reaching 23.5 mm SL, females 18 mm SL), and they are more easily caught by hand. It appears that there may be at least two males (possibly more) and several females and juveniles on a moderate sized soft coral colony.

Pleurosicya occidentalis sp. nov.
(Fig. 24)

Pleurosicya HKL sp. 3 - Winterbottom and Emery 1986:54 (Eagle Island, Peros Banhos, Salomon, and Three Brothers).

Type material. HOLOTYPE - USNM 264746: 18 mm SL male, Cargados Carajos Shoals, 0-2 m, V. Springer and party, 30 March 1976. PARATYPES - USNM 264749: 11(14-18), Cargados Carajos Shoals, about 2 miles E of Raphael Island, inside reef edge, 0-1 m, V. Springer and party, 3 April 1976. USNM 261968: 20 mm SL male, Cargados Carajos Shoals, just NE of Siren Island, 17-21 m, V. Springer and party, 12 April 1976. USNM 306895: 14(12.5-20), same data as holotype. RUSI 74-304, 7(11-14), St Brandon's Shoals. ROM 58029: 30(10.5-16), Chagos Archipelago, Great Chagos Bank, lagoon at Eagle Island, among corals, *Heliopora* sp., and *Millepora* sp., 0-0.5 m, R. Winterbottom *et al.*, 26 February 1979. ROM 58030: 2(14-15), Chagos Archipelago, Salomon Atoll, Isle Boddam lagoon, caves in side of flat-top bommie, 0-3 m, A. Emery *et al.*, 19 March 1979.

Additional material (not examined). SEYCHELLES - ANSP unregistered Station F-59: 8(13.5-18.5), Praslin Island, S shore just E of St Anne's Bay, 7.5 m, J. Bohlke and party, 22 February 1964.

Diagnosis. A somewhat slender *Pleurosicya* with a dense black spot on nape centre, and known only from the western Indian Ocean (Chagos Archipelago, Cargados Carajos Shoals, and Seychelles). Second dorsal and anal rays I,8. Pectoral rays 16-18. Lateral scales 24, TRB 5-6. Nape naked. Pelvic fins rounded, usually cup-like, with rounded lobes. Gill opening restricted to pectoral base. Tongue rounded, with pointed centre. Preserved colour includes dark stripe along bases of dorsal and anal fins, pectoral base dusky, and elongate, dense, black spot on centre of nape. Invertebrate host unknown.

Description. An asterisk indicates counts of holotype. Based on 33 specimens, 11.5-20 mm SL. First dorsal fin V(1), VI(31)*. Second dorsal fin I,6(1); I,7(1); I,8(29)*; I,9(1). Anal fin I,7(1); I,8(20)*; I,9(1). Pectoral rays 16(7), 17(24)*, 18(2). Lowermost 4-7 (mean 6)* pectoral rays unbranched, and sometimes thickened. Branched caudal rays 11(4)*. Nape naked. Longitudinal scale count 21-27, with mean of 24 (23 in holotype). TRB 5-7*, with mean of 6. Rakers on inner face of first gill arch very small, sometimes a few spines present, 1+1+4, 2+1+1, 2+0+3, 3+0+4. Lowermost third of first gill arch bound by membranc to inner face of operele.

Head and anterior half of body triangular in cross-section (apex dorsally), body quite compressed posteriorly (Fig. 24). Body relatively elongate, BDA 14-19% of SL (mean 16%). Head length 30-35%, averaging 32%, of SL. Head width always greater than head depth (mean width 63.8%, and mean depth 54%, of HL). Snout moderate, averaging 32% of HL. Mouth relatively large, slightly oblique or horizontal, upper jaw and lip slightly overhanging lower. Jaws end at a point below anterior half of eye, mean jaw length 40% of HL. Eye relatively small, 24-32% of HL (mean 29%), set dorsolaterally. Interorbital narrow, 2-5% of HL, averaging 3%. Nostrils close together near eye, anterior nostril in tube, posterior nostril in shorter tube or with very low rim. Tongue pointed, or bluntly rounded with pointed centre. Gill opening restricted to pectoral base (slightly further forward in three specimens).

First dorsal fin triangular, shorter than body depth. Second dorsal anteriorly nearly as tall as first. Anal rays unbranched. Caudal rounded, upper rays longer than lower. Pecto-

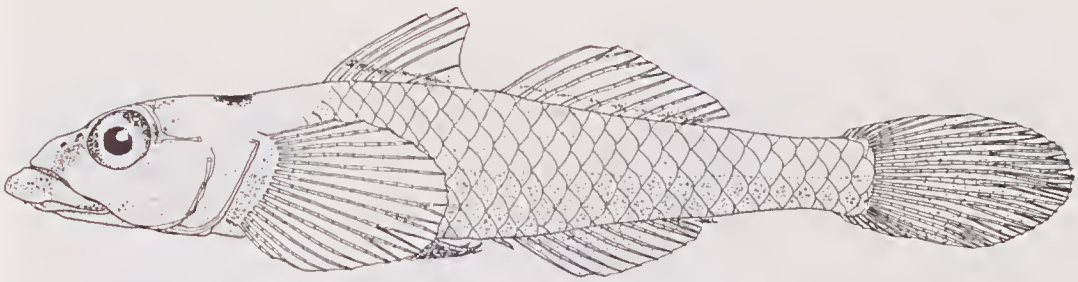


Fig. 24. *Pleurosicya occidentalis* holotype (USNM 264746), 18 mm male, from St. Brandon's Shoals.

ral rays reach to below sixth dorsal spine or nearly to gap between dorsals. Pelvic fins rounded, sometimes somewhat oval, but usually cup-shaped. Pelvic spine lobes usually round, not very fleshy, sometimes thin and slightly folded. Lobes and frenum often finely fimbriate. Fifth pelvic ray rather flattened near first branch point.

Upper jaw teeth very small, fine, and pointed; arranged in narrow band, broader anteriorly, narrowing at sides. Across front of upper jaw and mostly concealed by upper lip, eight to twelve enlarged, slender, curved teeth present; four to six anteriormost of these smaller than rest; posteriormost tooth on each side largest. Lower jaw with band of very small, fine, pointed teeth across front; band extends over edge of jaw, so that outermost (sometimes slightly enlarged and curved) row of moveable teeth angles downward and outward. Innermost, an even row of upright, pointed teeth; and one or two large curved canine teeth at each side of jaw symphysis.

Lateral line canals as for genus; canals on head may be open in smaller specimens.

Scales on sides of body extend up to behind pectoral base, but do not extend over base. Head and nape naked.

Male genital papilla flattened, slender, wider at base, narrowing toward tip. Tip usually slightly expanded, bearing several tiny lobes. Female genital papilla short, cylindrical, with several lobes at each side of opening at tip.

Colour in Life. No information available.

Colour in Alcohol. Body and head pale, with sides and pectoral base covered with brown melanophores. Head often lightly pigmented. Nape and dorsal midline areas with no or very little dusting of melanophores. Underside of head and belly unpigmented. Most conspicuous mark is an elongate dense black blotch on central midline of nape. Narrow brown streak on lower bases of dorsals and anal fins. First dorsal fin with dusky margin, sometimes absent. Second dorsal and anal fins often covered with brown pigment. Caudal fin with tiny spots forming about eight vertical lines, and posterior margin of fin with broad dusky band (which blends into the pattern of lines).

Comparisons. *Pleurosicya occidentalis* is very like *P. coerulea*, but the head is narrower (averaging 64% of HL for *occidentalis*, and 72% for *P. coerulea*), the snout is shorter on the average (32% of HL for *P. occidentalis* and 35% for *P. coerulea*), and the black nape spot is very intense (not diffuse or absent as in *P. coerulea*). *Pleurosicya coerulea* appears to have a slightly broader, more fleshy upper lip than does *P. occidentalis*, but this was not quantified. The two species are sympatric, and have been collected together at the same rotenone station (ROM WE 79-40, in the Chagos Archipelago).

Remarks. Unfortunately, no information is available as to this species' preferred commensal organism. All specimens were obtained from rotenone stations in relatively shallow water (0-25 m), with the exception of those from RUSI (collection data unknown).

The gut of one damaged specimen was examined. It was simple, with a single loop as in *P. coerulea*, and it contained a few copepods and a little flocculent material.

Etymology. The species name is derived from the Latin, meaning "western", referring to the western Indian Ocean distribution of this species.

Pleurosicya plicata sp. nov.
(Figs 25-26)

Pleurosicya HKL sp. 12 - Winterbottom and Emery 1986:55, Fig. 81 (primarily lagoons at Peros Banhos, Salomon, and Three Brothers).

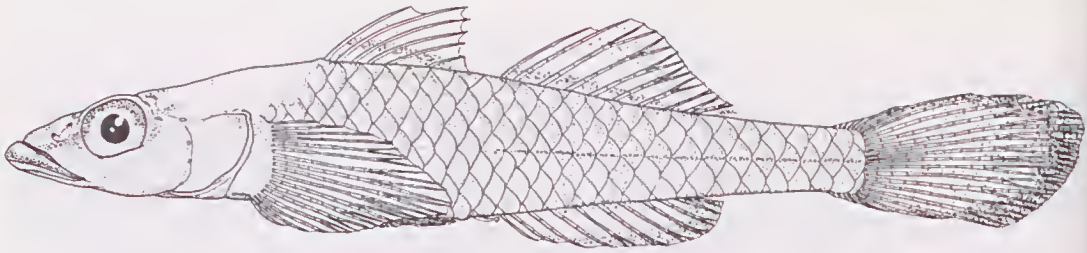


Fig. 25. *Pleurosicya plicata* holotype (ROM 58031), 19 mm male, from Salomon Atoll, Chagos Archipelago.

Pleurosicya 'sp. 12' - Allen and Russell 1986:99 (Rowley Shoals).

Type material. HOLOTYPE - ROM 58031, 19 mm SL male, Chagos Archipelago, Salomon Atoll, N of jetty off Isle Boddam, 10-15 m, coral heads on sand, R. Winterbottom *et al.*, 15 March 1979. PARATYPES - ZMUC P.781661: 18 mm SL male, Mauritius, Tombeau Bay, sand and coral, 12 m, 8 October 1929, T. Mortensen Station 38. ROM 58032: 9(15-19.5), Chagos Archipelago, Peros Banhos, off S end Isle Montepatre, knoll of *Acropora* and *Microdictyon* algae, 32 m, A. Emery *et al.*, 2 March 1979. ROM 58033: 23(8-19), same data as holotype. ROM 58034: 2(11-19.5). Chagos Archipelago, Peros Banhos, Isle de Coin, 25 m, small coral knoll, A. Emery *et al.*, 3 March 1979. ROM 58035: 6(11.5-18), Chagos Archipelago, lagoon side of Isle Poule, coral and sand patch reef, sheet *Acropora* dominant, 21-30 m, R. Winterbottom and A. Emery, 12 February 1979. WAM P.27666-027: 22 mm SL male, Western Australia, Rowley Shoals, Mermaid Reef, E side of lagoon, 15-18 m, 26 July 1982, G.R. Allen. NTM S.11388-021: 21 mm SL male, Western Australia, Seringapatam Reef, B.C. Russell, 12 September 1984. USNM 306896: 15.5 mm SL male, Papua New Guinea, Hermit Island, E side of Jalun Island, 0-33 m, 2 November 1978, V. Springer and party. USNM 306897: 16.5 mm SL male, Papua New Guinea, Kranket Island, lagoon on NW side, 0-20 m, 7 November 1978, V. Springer and party. USNM 225001: 17 mm SL male, Western Caroline Islands, Ponape, reef just S of Param Island, 0-14 m, V.Springer and party, 6 September 1980. CAS 68078: 22.5 mm SL male, Western Caroline Islands, Palau, W end of Koror Island, sand flat enclosed by retaining wall, 8 July 1955, H. Fehlmann and party. CAS 36870: 19 mm SL male, Western Caroline Islands, Palau, N side Urukthapel Island, shallow pass S of Butottoribo Island, H. Fehlmann and party, 20 July 1955. CAS 36889: 20 mm SL female, Western Caroline Islands, Palau, Iwayama Bay, off SE point of Sanryo Island, H. DeWitt and party, 18 November 1957. CAS 36883: 6(15-18.5), Western Caroline Islands, Palau, Babelthuap Island, in Gongolungel Strait, H. DeWitt and party, 25 September 1957. AMS I.21939-005: 19 mm SL male, Philippines, Apo Island, 27 m, C. Ferraris, 1980.

Diagnosis. A slender *Pleurosicya* with naked nape, wide gill opening, and trilobed tongue. Soft dorsal and anal rays I,8. Pectoral rays 15-17. Lateral scales 25, TRB 7. Nape naked. Pelvic fins long and flat, with pelvic spine lobes usually long, thin and folded inward. Gill opening relatively wide, to below preopercle or nearly reaching eye. Tongue trilobed. Pale fish, with lower half of body dusky, upper half with scale margins faintly outlined, nape with light dusky blotches, stripe usually visible from each eye to snout tip, no black markings present. Commensal invertebrate host unknown.

Description. An asterisk indicates counts of holotype. Based on 36 specimens, 11-22.5 mm SL. First dorsal fin VI(36)*. Second dorsal fin I,7(2); I,8(33)*. Anal fin I,7(1); I,8(33); I,9(1)*. Pectoral rays 15(11), 16(16), 17(7)*, 18(1). Lowermost 2-4 (mean 3*) pectoral rays unbranched, skin at tips of rays sometimes thickened. Branched caudal rays 11(4). No scales on sides of nape or predorsal. Longitudinal scales 22-26 (mean 25, 24 in holotype). TRB 6-8 (mean 7*). Gill rakers on first arch very reduced stubs, without spines, 1+1+5 (1), 2+0+5 (1), 2+1+5 (1), 2+0+6 (1). Rakers on inner faces short, with tiny spines. Lowermost quarter or third of first arch bound by membrane to inner face of opercle.

Head and anterior half of body rounded to roughly triangular in cross-section, posterior half of body quite compressed (Fig. 25). Body rather elongate, BDA 14-19% of SL (mean

16%). Head length 30-39% of SL (mean 33%). Head width greater than head depth, with mean width 53% and mean depth 45% of HL. Snout moderate to long, greater than eye, averaging 30% of HL, almost rectangular in shape from above. Mouth moderate, terminal, and slightly oblique, reaching to below at least anterior margin of eye. Lips narrow, not fleshy. Jaw length 33-45% of HL (mean 37%). Eyes equal to or less than snout, set dorsolaterally, and averaging 27% of HL. Interorbital narrow, 3-7% of SL (mean 4%). Anterior nostril in short tube, set halfway between eye and upper lip; posterior nostril with low rim. Tongue trilobed or weakly trilobed, blunt in two specimens. Gill opening reaches to at least below preopercular edge, nearly reaching eye in two specimens.

First dorsal fin triangular, second dorsal fin higher than first anteriorly. First three or four anal fin rays unbranched. Caudal fin truncate, upper rays slightly longer than lower. Pectoral fins nearly reach to below gap between dorsals. Pelvic fins equal to pectorals in length, usually reach anus, forming an oval flattened cup. Pelvic spines straight, and pelvic spine lobes long, flat and folded (Fig. 26). Lobes and frenum may be smooth or fimbriate (nine specimens from Chagos with lobes and frenum very thin and reduced).

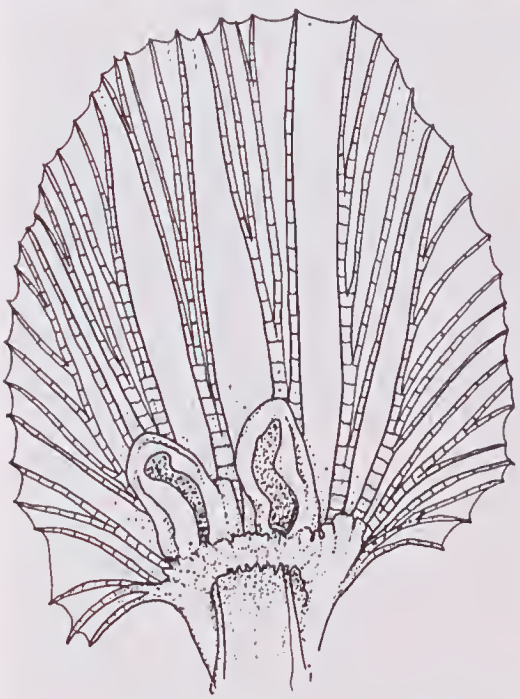


Fig. 26. Pelvic fins of *Pleurosicya plicata* (one of CAS 36883), showing elongated pelvic spine lobes.

Teeth in outermost row of upper jaw enlarged, especially anteriormost 10 or 12, which are curved and sharp, and spaced apart from each other; rest of teeth smaller and less curved (almost straight at rear of jaw). Innermost two to three rows of upper jaw teeth composed of very small sharp teeth forming band (widest anteriorly). Lower jaw with innermost row of relatively stout sharp teeth (largest at sides of jaw). Outside this row, a band, formed by crowded rows of tiny sharp teeth, which widens anteriorly; outermost teeth straight, pointing outward or horizontally, and moveable. Innermost, a large stout curved tooth on either side of lower jaw symphysis.

Lateral line canals as for genus.

Scales on body reach up to behind pectoral base, but do not extend over base. Head, nape, belly midline and breast naked.

Male genital papilla moderately elongate, broad and flattened, with tip expanded and finely fimbriate. Female genital papilla short and round, with at least two pairs of tiny lobes at each side of opening at tip; tip sometimes fimbriate.

Colour in Life. Freshly dead colour based on three slides of ROM paratypes, including the specimen illustrated in Figure 81 in Winterbottom and Emery (1986). Head and body pale pink to reddish orange. Scale margins narrowly outlined in darker red. Nape and upper back up to gap between dorsals with scattered melanophores. Snout, head behind eyes, upper preoperele, and operele orange to reddish, darker than body, with narrow dark red stripe from eye to tip of snout. Tip of upper lip orange, not red, and lower margin of upper lip dark red, especially so posteriorly, where colour extends variably onto lower margin of preopercle. Lower jaw whitish or translucent. Cheek from below eye to upper jaw without pigment. Iris pale golden, with orange red pigment before and behind iris, also usually on dorsal half of eye. Fins damaged, but unpaired fins appear dusky with red markings. Caudal fin pale with irregular vertical bands of reddish spots and speckles near base. First dorsal with diffuse black line along posterior half of base, line continued anteriorly as red, somewhat diagonal, line. Second dorsal with line just above base, line formed by mixture of red

and black speckles; rest of fin dusky, fin margin probably reddish. Anal fin dusky, with red streak along base and margin. Pectoral fin translucent, rays faint reddish. Pelvic fins white.

Colour in Alcohol. In most specimens, body usually pale, with no black blotches. Sides of body with some sprinkling of melanophores. Upper pectoral base with faint dusky blotch in some specimens. Operele often with dusky patch dorsally. Usually, indistinct dusky patches and spots present behind eyes and on nape. Diffuse stripe of dusky pigment runs from eye below nostrils to upper lip; stripes do not meet each other at lip. Upper lip faintly dusky. In otherwise pale specimen from Seringapatam Reef, iris silvery, dark dorsally. Fins hyaline, first dorsal often with light brown speckles posteriorly, and on margin. Caudal may have faint dusky rear margin.

Specimens from Chagos Archipelago similar to the above, but fins and sides of body show more pigmentation. Lower half of body light dusky, margins of scales on upper half distinctly dusky. Both dorsal fins with thin brown stripe just above bases, stripe extending length of fins. Second dorsal may have faint, narrow dusky margin as does first dorsal. Lips often quite dusky; nape with narrow brown line along midline in more heavily pigmented specimens.

Comparisons. This species is similar in body proportions to *P. bilobata*, but can be distinguished by having the tongue trilobed (versus bilobed), and by colour pattern (scale margins on upper body outlined in dusky pigment and no black blotches, versus 12 brown bars and a black blotch on the soft dorsal fin in males). Other slender species of *Pleurosicya* (such as *P. carolinensis* and *P. elongata)* have the gill opening restricted to the pectoral base. Of these, *P. carolinensis* is the most similar, but has a blunt to round tongue, and a large curved tooth at each side of the triangular lower jaw.

Remarks. There is no information available as to this species's preferred host invertebrate. It has been collected in moderately deep water, in both lagoon and reef channel habitats.

Etymology. The species name is from the Latin *plicata*, meaning folded, referring to the folding of the narrow pelvic fin lobes.

Pleurosicya prognatha Goren
(Figs 27-28)

Pleurosicya prognatha Goren, 1984:76-78 (Marsa Bareeha, southern Sinai Peninsula).

Type material. HOLOTYPE - TAU P.6478: 14.4 mm SL male, Marsa Bareeha, southern Sinai Peninsula, 16 October 1979. PARATYPES - TAU P.6416: 3(8-11), same data as holotype. TAU P.6478: 11.5 mm SL male, Elat, Red Sea, 20 m, 26 June 1983.

Additional material. RED SEA - USNM 306898: 10.5 mm female, reef near road at Marsa Muqabita, NW coast Gulf of Aqaba, V. Springer, 17 July 1969. USNM 306899: 11.5 mm female, Bay at El Himeira, NW coast Aqaba, 0-16 m, V. Springer, 16 July 1969. IL.428-018: 13 mm male, Dorale Reef, near Djibouti, 1 m, J.-M. Rose, 18 January 1981. GREAT BARRIER REEF - AMS I.22578-093: 9(9-12.5), Escape Reef, Australian Museum coll., 28 October 1981. AMS I.22618-001: 2(11-14), Escape Reef. AMS I.22631-073: 3(11-15), Escape Reef. WESTERN AUSTRALIA - AMS I.21316-001: 9(6-11.5), Scott Reef, south reef lagoon, large staghorn beds on sand, 7-10 m, F. Talbot, 20 September 1979. WAM P.28030-040: 10(8-14), Rowley Shoals, Clerke Reef, central lagoon basin, 3-5 M, G. Allen, R. Steene, 11 August 1983.

Diagnosis. A very small *Pleurosicya* with the tip of the upper jaw and lip extremely elongated, giving it the appearance of a curved beak. Second dorsal and anal rays 1,8. Pectoral rays usually 15. Sealation reduced, anterior third of body mostly naked. Lateral scales 20, TRB about 5. Gill opening restricted to pectoral base. Tongue small, pointed or rounded. Colour generally pale in females, males evenly dusky; no black blotches on fins. Commensal with large *Acropora* spp.

Description. An asterisk indicates counts of holotype. Based on 29 specimens, 8-15 mm SL. First dorsal fin VI(28)*. Second dorsal I,8*(26); I,9 (2). Anal I,8 (27); I,9* (holotype only). Pectoral rays 14 (1), 15* (21), 16(6). Pectoral rays all unbranched in nine specimens; 19 specimens have lowermost 1-8 rays (mean 5)* unbranched and sometimes slightly thickened. Branched caudal rays 11 (7), 12*. Head naked, as is anterior half of body. Lateral scale count 15-27 (mean 21, 22 in holotype). TRB 1-10 (mean 5, 7 in holotype). Gill rakers

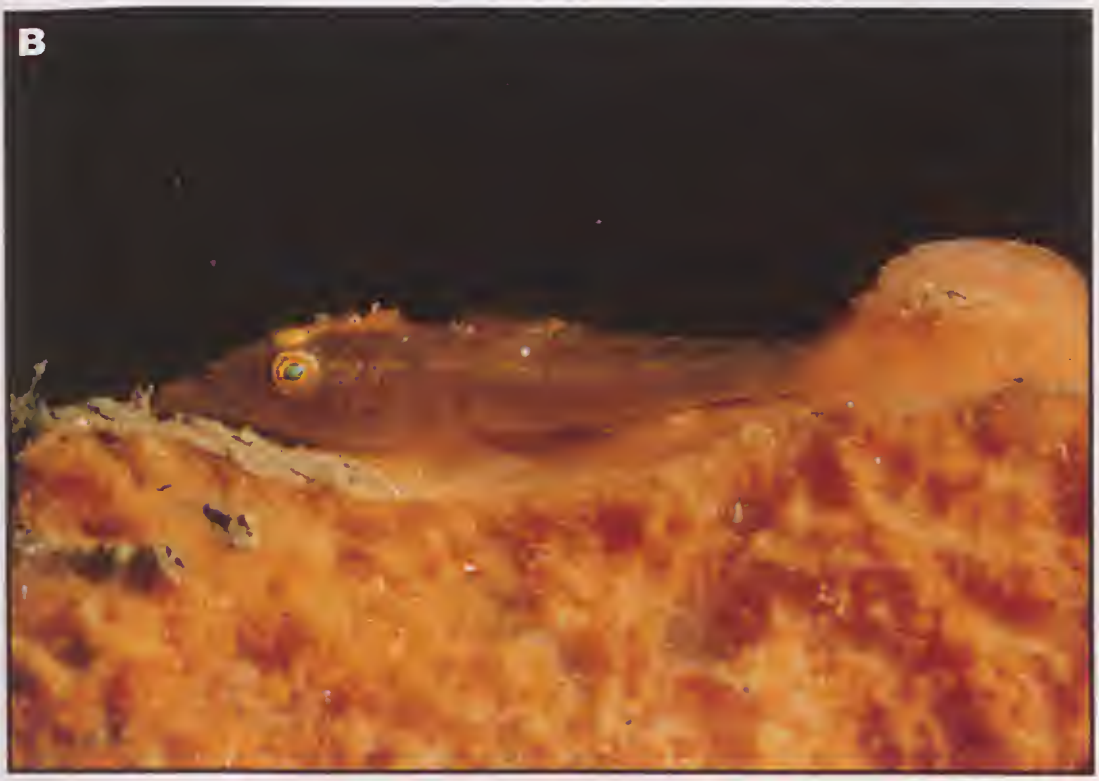


Plate III. **a.** *Pleurosicya mossambica* on the calcareous alga *Halimeda* sp., Mrs Watson's Bay, Lizard Island, Queensland. Photo by Rudie Kuiter. **b.** *Pleurosicya mossambica* on an orange sponge from Watson's Bay, Sydney Harbour, New South Wales. Photo by Rudie Kuiter.

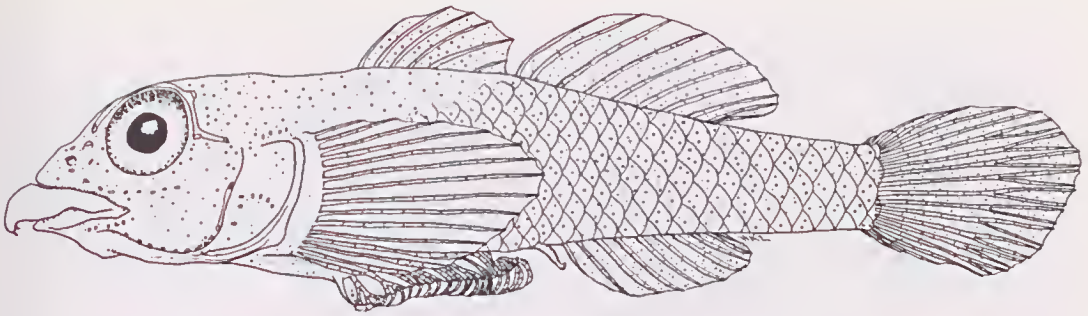


Fig. 27. *Pleurosicya prognatha* (one of WAM P.28030-040), composite based on two males from Rowley Shoals, Western Australia.

on outer face of first arch consist of tiny bumps: 1+4 (1), 2+4 (1), with lower quarter of arch bound by membrane to opercle.

Head and body somewhat compressed, especially posteriorly. Body short but slender, depth at anus 18% (14-24%) of SL (Fig. 27). Head relatively long, 35% (32-41%) of SL. Head depth (mean 59%) usually greater than head width (mean 56%). Snout rather concave in profile, long (33-44% of HL, mean 39%), with tip of upper lip elongated, fleshy, and usually pointed, turning downwards over front of mouth, giving fish unmistakable parrot-like profile. Mouth terminal, nearly horizontal, with jaws ending at point below margin or anterior half of eye. Tip of upper jaw narrow, with cartilaginous tooth-bearing projection (slightly expanded anteriorly) present, as long or longer than upper lip. Eyes large, lateral, averaging 31% of HL, and usually forming part of profile. Interorbital narrow, 5% of HL. Anterior nostrils in slender tube, posterior with low rim. Tongue short and small, pointed to rounded, and absent in two specimens. Gill opening restricted to pectoral base.

Both dorsals low and rounded, first dorsal not much taller than second. Anal rays all unbranched. Caudal truncate to rounded. Pectorals reach to below gap between dorsals. Pelvic fins rounded and cup-like, usually reaching to past anus. Pelvic spine lobes rounded in shape. Skin of lobes and frenum thickened, fimbriate, and distal third to half of pelvic rays usually fimbriate also. Fifth pelvic ray quite flattened at first branch point.

Upper jaw narrow, with one to two rows of tiny, slightly curved, pointed teeth, and a curved canine tooth on either side of cartilaginous projection (Fig. 28A). A patch of tiny, curved, sharp teeth at tip of projection, which may protrude outside upper lip (Fig. 28B). Lower jaw with one row of backwardly curved pointed teeth along sides, and band of fine pointed teeth across front of jaw (largest teeth outermost). A pair of stout curved canines behind tooth bands at symphysis.

Lateral line canals of head generally as for genus, but only two preopercular pores usually present (three pores on right preopercle in holotype).

Scales on mid-side of body usually reach to below gap between dorsals, with one to several rows (which may consist of isolated scales only) continuing forward to behind pectoral fin. Six specimens (including holotype) have body nearly fully scaled to up behind pectoral fin.

Male genital papilla elongate, wide at base and narrowing towards tip, which is expanded, bearing many tiny villi. Female genital papilla short, round, with many small lobes at tip.

Colour in Life. Goren (1984) records *P. prognatha* as being transparent when live, with "black pigmentation around the eyes and a light yellow shade around the viscera". No

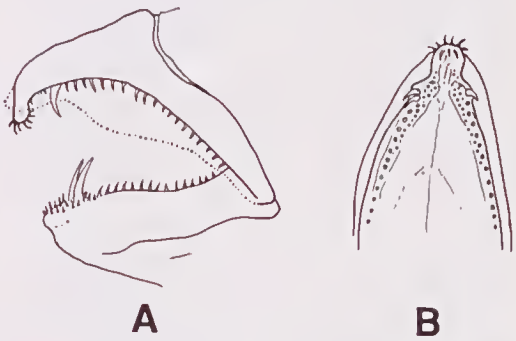


Fig. 28. A, Lateral view of teeth and jaws of male *Pleurosicya prognatha* (one of WAM P.28030-040), outline of upper lip indicated by dotted line). B, Ventral view of upper jaw of same specimen, showing cartilaginous projection.

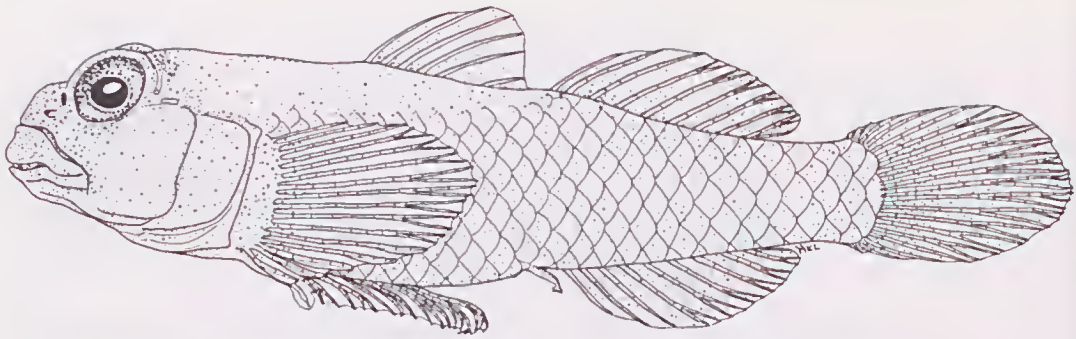


Fig. 29. Holotype of *Pleurosicya spongicola* (NTM S.11355-001). 13.5 mm male from Lombok.

further colour notes are available. Examination of freshly preserved material shows the iris to be silvery pink to rose coloured, and the body and fins of males to be quite dusky. No distinct black spots.

Colour in Alcohol. Females are plain hyaline, with the peritoneum speckled lightly with melanophores, usually showing through the body wall. At least distal third to half of soft dorsal, anal, and usually part of caudal fins scattered with melanophores; other fins transparent. No distinct blotches or spots. Several specimens from Clerke Reef with tiny brown or blackish spot on edge of preopercle near lower preopercular pore. Small males similar. Adult males evenly dusky over head, body and unpaired fins. Dorsals and caudal sometimes dark brown. Pectorals and pelvics unpigmented. One relatively large (14 mm SL) male had a lighter-coloured broad band across the side between the dorsals, and the head and nape abruptly paler (from first dorsal origin forward).

Comparisons. This species and *P. fringilla* are very similar in appearance. *Pleurosicya prognatha* can be distinguished by the elongation of the upper jaw and lip, in lacking a black blotch on the anterior rays of the anal fin as present in male *P. fringilla*, and in tending to be smaller than *P. fringilla*. Both species are distinguished from most other members of the genus in having a process extending from the preopercle towards the symplectic process (and nearly meeting). Also, these fish are found in similar lagoon habitats (staghorn coral thickets), and may occur together. *Pleurosicya fringilla* is more common than *P. prognatha*.

Remarks. The flap on the upper margin of the eye mentioned by Goren (1984) is an artefact of preservation, a fold of skin on the eye of the holotype, which is slightly dehydrated.

This species inhabits large staghorn coral thickets (probably *Acropora formosa* and/or *Acropora grandis*), which grow on shallow to deep lagoonal habitats. They probably cling to the underside of the branches as does *P. fringilla*.

Pleurosicya spongicola sp. nov.
(Fig. 29)

Type material. HOLOTYPE - NTM S.11355-001; 13.5 mm SL male, Indonesia, Lombok Strait, off SW coast of Lombok, 40 m depth, from inside sponge, B. Russell, 24 August 1984. PARATYPES - NTM S.11355-002; 13 mm SL female, same data as holotype. LON unregistered; 13 mm SL male, same data as preceding.

Diagnosis. A small, stocky *Pleurosicya* with small eyes and steep snout. Second dorsal rays 1,8; anal rays 1,8. Pectoral rays 16-17. Lateral scales 25, TRB 8. Body fully scaled, head and nape naked. Small canine tooth present at side of lower jaw. Tongue broad and round. Gill opening restricted to pectoral base. Body and fins evenly dark brown. Commensal on sponges, in trawl-depth water.

Description. Based on three specimens, 13-13.5 mm SL. First dorsal fin VI (3). Second dorsal 1,8 (3). Anal 1,8 (3). Pectoral rays 16 (1), 17 (2). Lowermost 5 pectoral rays unbranched, and thickened distally. Branched caudal rays 11(2), 10(1). Longitudinal scale count 25 (3). TRB 8 (3). Gill rakers on outer face of first arch almost absent, 1+1+1 (in 1), tiny thin bumps only; rakers on rear of arches very small, without spines. Lower quarter of first gill arch bound by membrane to opercular wall.

Head roughly triangular, blunt apex dorsally. Body compressed, somewhat rounded anteriorly. Body stocky, depth at anus 19-22% of SL (Fig. 29). Head length 32-35% of SL. Head depth less than, but almost equal to, head width. Snout short, steep, 30-36% of SL. Mouth horizontal, barely sub-terminal, upper jaw slightly overhanging lower. Jaws 35% of HL, end at point below anterior half of eye. Eyes small, lateral, set high on head and forming part of dorsal profile, 27-31% of HL. Interorbital moderate, 5-9% of HL. Anterior nostril in short slender tube, halfway between lip and rim of eye; posterior nostril round, flat, placed close to anterior edge of eye. Tongue medium-sized, broad and rounded. Gill opening restricted to pectoral base.

First dorsal fin low, rounded; unpaired fins rounded, including caudal. Posteriormost three to five anal fin rays branched in two largest specimens. Pectorals short, reach back to below sixth dorsal spine origin. Pelvies oval, when flattened reach anus in all specimens; pelvic spine lobes short, round; frenum low, short. Pelvic rays slender, first branch point of fifth ray close to base.

Upper lip broad, slightly overhangs front of lower jaw in two specimens. Upper jaw with band of tiny sharp teeth, broadest anterirly, narrowing to one row at sides, and four to six large curved teeth outermost across front of jaw. Lower jaw roughly triangular, with band of tiny upright sharp teeth, broad anteriorly, narrowing to one row at sides posteriorly. Outermost teeth across front of lower jaw slightly larger than inner teeth. Small curved canine at side of lower jaw, at point where band of teeth becomes one row; canine larger in males, reduced but present in female specimen. Large curved tooth present on either side of lower jaw symphysis, behind rows of teeth.

Lateral line canals of head generally as for genus; anterior and posterior interorbital pores in two specimens fused together in one large opening in centre of interorbital space, and lateral canals very short. No preopercular pores in same two specimens, two preopercular pores on each side in remaining specimen.

In all specimens, scales on body extend up to behind pectoral fin, absent from head and nape.

Genital papilla in male moderate, wide at base and flattened, with group of tiny lobes at slightly expanded tip. Female papilla short, rounded but not bulbous, with several small lobes at either side of opening at tip.

Colour in Life. No live colour information available.

Colour in Alcohol. Head and body evenly covered with brown pigment, lighter on belly and underside of head. Nape immediately behind eyes, and interorbital region, quite dark brown. Midline of nape behind eyes with very dark brown line, extending from point above preopercular edge to end of operele. Dark brown stripe from front of eye to tip of snout, and a second such stripe visible on female from just above rear nostril to upper lip. Upper lip darker than lower. Both dorsals, anal, and caudal covered by dense brown speckles. Pectoral fin similar in female; in males (roughly) proximal half of pectoral pigmented. Pelvies hyaline.

Comparisons. This fish is very similar to *P. fringilla*, but has a broad, rounded tongue (instead of small, narrow, pointed tongue at back of throat), a higher pectoral ray count (16-17, versus 15-16 in *fringilla*), very steep, short snout; small canine at each side of lower jaws (absent in *fringilla*), and a different invertebrate host (*P. spongicola* lives on a sponge, whereas *P. fringilla* lives among *Acropora* corals). So far this species is known only from three specimens. *Pleurosicya fringilla*, which greatly resembles this species, has not been collected from depths greater than 27 m, and its depth distribution is undoubtedly linked to that of its host corals (which generally prefer lagoon conditions).

Remarks. *Pleurosicya spongicola* is known from three specimens, which were obtained by trawling in 40 metres of water. The sponge in which the specimens were found was broken up on deck (unfortunately none of the sponge was retained).

Etymology. The species name *spongicola* refers to its association with a sponge host, from the Latin.

DISCUSSION

There are differences in proportions and physiognomy among species of *Luposicya* and *Pleurosicya*, and in some species these differences are of use in their identification. Consequently, small juveniles are sometimes difficult (or impossible) to identify to species with any certainty, and this is especially true if they

are not in good condition. In contrast, there are very few differences between the species in their meristics. *Pleurosicya boldinghi* stands apart in having different dorsal ray counts, and in having the highest pectoral ray count (Tables 3 and 4). *Pleurosicya carolinensis*, *P. fringilla*, and *P. prognatha* all have low pectoral ray counts, with an average of 15 rays (Table 4). Most species have the lowermost four or five pectoral rays unbranched (Table 5), but *P. muscarum* has very few, averaging only two unbranched rays (*P. carolinensis* has three, the next lowest).

There appear to be several species-groups within *Pleurosicya*: one group consisting of five species, three groups with species-pairs, and another five single species groups which do not share any distinguishing characters. The first group of five species consists of the relatively generalised *P. annandalei*, *P. australis*, *P. boldinghi*, *P. micheli* and *P. mossambica*. These are species with similar teeth arrangements, scaled predorsal regions and wide gill openings. The second to fourth groups are the species-pairs: (a) *P. elongata* and *P. labiata* (which share jaw, teeth, and tongue structure), (b) *P. coerulea* and *P. occidentalis* (with naked predorsal and similar morphology), and (c) the most specialised pair *P. fringilla* and *P. prognotha* (sharing body proportions, tongue morphology, and preopercular osteology). The remaining five species without any obvious affinities with other groups are: *P. bilobata*, *P. carolinensis*, *P. spongicola*, *P. muscarum*, and *P. plicata*. *Pleurosicya carolinensis* resembles *P. elongata* and *P. labiatus*, but with different tongue shape; *P. plicata* differs from any of the others: *P. spongicola* is similar to *P. fringilla* and *P. prognatha* but with a different tongue shape; and both *P. bilobata* and *P. muscarum* are similar to the *P. mossambica* group, but with naked predorsals and different physiognomies.

Pleurosicya and the four genera to which it is related (*Bryaninops*, *Lobulogobius*, *Luposicya*, *Phyllogobius*) form a close-knit group characterised by the unique form of the pelvic frenum and pelvic spine lobes. The forwardly-folded frenum and flattened rounded lobes around the spines somewhat resemble those of the freshwater-dwelling sicydiine gobies, which prompted some earlier workers (e.g. Koumans 1953) to include the *Pleurosicya* group with the sicydiines. However, sicydiines have specialised teeth, lips, and osteology, separating them from gobiines such as *Pleurosicya* (Hoese 1984). Characters separating *Pleurosicya* and *Bryaninops* have been discussed elsewhere (Larson 1985).

Phyllogobius at first sight resembles an extremely flattened *Pleurosicya* (it is a sponge-commensal, unlike most *Bryaninops* and *Lobulogobius* species). Larson (1986) pointed out the differences and similarities between *Pleurosicya* and *Phyllogobius*.

Lobulogobius also resembles *Pleurosicya*; *L. omanensis* more so than *L. morrigu*. *Lobulogobius* differs in its unrestricted gill opening, wide interorbital with anterior interorbital pores paired (and often one of these is absent), in having all pectoral rays branched (in adults), and in having one more anal ray than soft dorsal rays. This latter character sets *Lobulogobius* apart from the other genera of this group, which all have the number of anal rays equal to that of the soft dorsal rays. *Lobulogobius omanensis* also has unique large slitlike nasal pores, unlike any *Pleurosicya* species.

All these fishes are considered to be commensals, in the broad sense of sharing a common food source with their hosts (zooplankton, in part), and in the fish's specificity to the host invertebrate. Of the 16 *Pleurosicya* species, eight are known to be host-specific commensals. They are: *P. bilobata* on broad-bladed seagrasses, *P. fringilla* and *P. prognotha* on large *Acropora* thickets, *P. coerulea* on *Heliopora coerulea*, *P. muscarum* on alcyonarians, *P. micheli* on hard corals, *P. labiata* on barrel-sponges (species uncertain but possibly *Xestospongia testudinaria*), and *P. elongata* on *Ianthella basta*. Only two of these are so far known to be quite species-specific in their host relationship (*P. coerulea* and *P. elongata*). *Pleurosicya mossambica* is commensal on such a variety of organisms that it is possible only to say that it is most often found on soft corals and sponges. Large *Dendronephthya* sp. (Japan) and a seapen (New Guinea) are the known hosts for *P. boldinghi*, and *P. spongicola* is known from an unidentified sponge. Further fieldwork may discover hosts for the other species (*P. annandolei*, *P. australis*, *P. carolinensis*, *P. occidentalis*, and *P. plicata*), but we presently know very little about these.

In the related genus *Bryaninops*, only three out of the 10 species are known to be definitely

Table 2. Counts and measurements of primary type specimens of the species of *Pleurosicya* (measurements in mm).

	Holotype ANSP 51094 *annandalei*	Holotype BPBM 17280 *australis*	Lectotype USNM 203588 *bilabata*	Lectotype ZMA 100.209 *baldinghi*	Holotype CAS 36875 *carolinensis*	Holotype NTM S.12658-001 *coerulea*	Holotype NTM S.12654-001 *elongata*	Holotype USNM 242091 *fringilla*	Lectotype ZMA 112.904 *labiata*	Neotype out of AMS I.21918-069 *micheli*	Holotype RUSI 227 *mossambica*	Syntype USNM 51782 *muscarum*	Holotype USNM 264746 *accidentalis*	Holotype ROM 58031 *plicata*	Holotype TAU P.6478 *pragnatha*	Holotype NTM S.11355-001 *spangicola*
First dorsal	VI	VI	VI	VI	VI	VI	VI	-	VI	VI	VI	VI	VI	VI	VI	VI
Second dorsal	I,8	I,8	I,8	I,7	I,8	I,8	I,8	I,9	I,8	I,8	I,8	I,7	I,8	I,8	I,8	I,8
Anal	I,8	I,8	I,8	I,8	I,8	I,8	I,8	I,8	I,8	I,8	I,8	I,8	I,8	I,9	I,9	I,8
Pectoral	20	17	16	20	15	16	15	16	16	18	17	17	17	17	15	15
Unbranched rays	-	4	5	-	4	6	4	5	-	4	4	-	6	3	5	5
Lateral line	24	24	24	25	24	24	25	24	24	-	23	-	23	24	22	25
Transverse scales backward	9	7	6	10	7	7	8	8	9	7	-	7	7	7	8	
Standard length	25	25	19	26	26	16	29	15	19	17.5	18	13	18	19	15	14
Head length	8.7	8.7	6.0	9.7	7.5	5.3	8.2	5.2	5.4	5.6	5.8	4.3	5.7	5.9	4.7	4.7
Head depth	-	4.7	2.5	6.7	3.9	3.0	4.4	3.0	3.2	3.0	3.3	2.3	3.0	2.7	2.9	3.3
Head width	-	4.9	3.8	6.3	4.1	4.2	4.9	3.2	3.3	3.2	3.6	2.5	3.8	3.2	2.5	3.6
Body depth at anus	5.4	5.2	2.5	6.8	4.1	2.9	4.2	2.4	3.4	3.0	3.2	2.4	2.9	3.2	3.0	2.9
Caudal length	-	5.6	3.8	-	-	3.6	6.4	3.3	3.5	4.1	3.6	-	4.1	4.4	-	3.3
Pectoral length	-	5.0	3.5	-	4.7	3.0	5.7	3.2	-	3.5	3.6	-	3.6	4.0	3.4	2.9
Pelvic length	-	4.9	2.9	4.8	4.4	3.1	5.2	3.2	5.1	3.3	3.6	1.9	3.8	3.8	2.9	3.3
Caudal ped. length	-	5.2	4.1	5.0	6.3	3.8	7.7	3.0	4.1	4.0	4.0	2.9	4.1	3.9	2.9	2.2
Caudal ped. width	-	2.3	1.7	3.6	2.2	1.6	2.5	1.4	2.1	1.6	1.7	1.1	1.5	1.8	1.5	1.7
Snout	-	2.4	2.2	3.3	2.7	2.2	3.2	1.9	1.8	1.4	1.8	1.4	2.1	1.8	1.8	1.5
Eye	-	2.4	1.4	2.2	1.9	1.4	2.3	1.5	1.5	1.6	1.7	1.2	1.5	1.5	1.4	1.3
Mouth	4.7	4.0	2.5	4.8	3.2	2.3	3.4	2.0	1.8	2.3	2.9	1.9	2.4	2.1	1.9	1.6
Interorbit	-	0.3	0.5	0.7	0.6	0.2	0.5	0.1	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.4

Table 3. Range of morphometrics in *Pleurosicya* species examined. Mean and range (in parentheses) are given for each species, as percentages of HL or SL (as indicated)

	annandalei	*australis*	*bilobata*	*boldinghi*	*carolinensis*	*coerulea*	*elongata*	*fringilla*	*labiata*	*micheli*	*mossambica*	*muscarum*	*occidentalis*	*plicata*	*prognatha*	*spongicola*
Standard length	21.1 (13.5-28)	19.7 (15-25)	17.3 (8.5-23)	20.7 (11-27.5)	17.8 (11-25.5)	14.8 (10.5-20)	20.7 (13-29)	13.8 (10-18.5)	19.9 (14-28)	16.4 (11-20.5)	18.0 (10.5-27)	16.5 (11-21.5)	15.4 (11.5-20)	17.5 (14-22.5)	12.0 (10-15)	13.0 (13-13.5)
Head length in SL	35 (32-39)	35 25-37)	33 (26-36)	36 (30-41)	30 (28-32)	32 29-36)	29 (26-33)	34 (31-36)	29 (26-31)	33 (31-37)	34 (30-38)	32 (29-36)	32 (30-35)	33 (30-39)	35 (32-41)	34 (32-35)
Head depth in HL	53 (48-60)	54 (51-56)	44 (36-50)	61 (56-68)	50 (46-64)	55 (49-60)	50 (44-58)	61 (52-67)	55 (46-62)	50 (44-57)	55 (48-74)	53 (45-64)	54 (48-64)	45 (41-50)	59 (53-71)	66 (64-70)
Head width in HL	59 (48-67)	53 (47-56)	58 (50-65)	57 (53-68)	58 (53-68)	72 (56-88)	57 (48-64)	64 (51-75)	6 (55-66)	57 (50-62)	64 (53-75)	61 (48-76)	64 (55-73)	53 (48-58)	56 (46-66)	74 (69-77)
Body depth at anus in SL	18 (15-22)	20 (19-20)	15 (11-16)	22 (17-26)	16 (14-18)	17 (15-26)	14 (12-16)	18 (15-22)	1 (13-20)	16 (14-21)	17 (15-19)	17 (14-21)	16 (14-19)	16 (14-19)	18 (14-24)	20 (19-22)
Caudal length in SL	24 (20-27)	22 22-22)	22 (19-24)	18 (21-27)	22 (19-25)	22 (18-25)	23 (20-26)	23 (21-25)	2 (19-25)	24 (21-27)	24 (20-28)	25 (23-30)	23 (20-25)	25 (22-31)	23 (21-26)	24 (23-25)
Pectoral length in SL	21 (19-24)	20 (19-22)	18 (14-20)	19 (18-26)	19 (16-21)	20 (17-24)	20 (18-24)	23 (21-28)	2 (20-23)	21 (19-24)	20 (18-24)	22 (19-25)	20 (16-22)	21 (18-27)	23 (19-27)	23 (22-24)
Pelvic length in SL	23 (20-26)	21 (20-22)	16 (21-21)	20 (18-24)	21 (17-24)	20 (17-23)	19 (17-23)	23 (17-28)	24 (21-28)	21 (19-24)	21 (18-26)	19 (15-25)	20 (18-24)	21 (18-24)	22 (19-26)	26 (24-29)
Caud. ped. length in SL	21 (20-23)	21 21-22)	21 (18-24)	19 (18-22)	23 (20-25)	21 (18-25)	25 (23-29)	21 (18-25)	24 (21-28)	23 (19-29)	21 (19-25)	23 (18-28)	22 (20-26)	23 (20-27)	20 (17-22)	18 (16-20)
Caud. ped. width in SL	10 (8-11)	10 (9-11)	8 (7-10)	13 (11-14)	9 (8-9)	9 (8-10)	8 (7-10)	10 (7-12)	10 (8-11)	9 (8-11)	10 (8-11)	10 (8-12)	9 (8-10)	9 (8-14)	10 (8-12)	12 (12-12)
Snout in HL	29 (24-33)	26 (24-28)	31 (25-37)	30 (26-37)	32 (25-37)	35 (28-42)	35 (25-52)	36 (28-43)	33 (27-38)	26 (21-30)	28 (21-34)	31 (23-38)	32 (26-39)	30 (27-36)	39 (33-34)	32 (30-36)
Eye in HL	27 (22-33)	28 (25-31)	25 (21-31)	25 (20-29)	29 (25-35)	29 (24-43)	30 (24-36)	29 (24-35)	27 (23-31)	30 (25-35)	28 (23-34)	25 (20-31)	29 (24-32)	27 (22-31)	31 (27-36)	29 (27-31)
Mouth in HL	47 (39-54)	46 (44-50)	42 (36-47)	43 (37-50)	40 (33-45)	42 (37-57)	36 (30-42)	37 (30-07)	34 (32-36)	42 (38-48)	45 (38-51)	43 (38-48)	40 (32-46)	37 (33-45)	38 (35-43)	35 (33-36)
Interorbit in HL	6 (3-11)	6 (5-7)	5 (3-8)	10 (7-15)	5 (3-9)	4 (2-7)	3 (1-6)	4 (2-5)	4 (2-8)	4 (2-5)	5 (3-7)	4 (2-7)	3 (2-5)	4 (3-7)	5 (3-8)	7 (5-9)

Table 4. Frequency of pectoral rays in *Pleurosicya* species.

Species	Number of pectoral rays								
	14	15	16	17	18	19	20	21	Mean
annandalei	-	-	-	3	6	15	3	-	19
australis	-	-	-	4	-	-	-	-	17
bilobata	-	-	12	11	5	1	-	-	17
boldinghi	-	-	-	-	1	2	12	4	20
carolinensis	7	15	2	-	-	-	-	-	15
coerulea	-	1	7	36	20	-	-	-	17
elongata	-	5	16	6	-	-	-	-	16
fringilla	4	24	13	-	-	-	-	-	15
labiata	-	3	12	3	1	-	-	-	16
micheli	-	-	2	20	11	1	-	-	17
mossambica	-	-	1	20	22	9	1	-	18
muscarum	-	-	1	21	16	7	-	-	18
occidentalis	-	-	7	24	1	-	-	-	17
plicata	-	11	14	6	1	-	-	-	16
prognatha	1	18	4	-	-	-	-	-	15
spongicola	-	-	1	2	-	-	-	-	17

Table 5. Frequency of unbranched lower pectoral rays in *Pleurosicya* species.

Species	Number of unbranched rays								
	1	2	3	4	5	6	7	8	Mean
annandalei	-	-	3	12	10	-	-	-	4
australis	-	-	2	1	1	-	-	-	4
bilobata	-	-	1	6	7	5	3	-	5
boldinghi	-	3	6	3	4	2	-	-	4
carolinensis	-	3	8	5	1	-	-	-	3
coerulea	-	-	-	5	30	21	2	-	5
elongata	-	-	-	3	8	13	3	-	6
fringilla	-	-	-	2	27	13	-	-	5
labiata	-	-	5	8	2	3	-	-	4
micheli	-	2	7	13	8	-	-	-	4
mossambica	-	-	3	11	30	5	2	1	5
muscarum	13	15	8	-	-	1	1	-	2
occidentalis	-	-	-	3	12	11	4	-	6
plicata	-	3	20	6	-	-	-	-	3
prognatha	1	-	-	1	7	4	1	1	5
spongicola	-	-	-	-	3	-	-	-	5

species-specific in host choice (*B. isis* on *Isis hippuris*, *B. tigris* on *Antipathes* sp., and *B. yongei* on *Cirrhipathes anguina*). The other species are more generally host-specific: e.g. *B. erythrops* and *B. nexus* occur on several *Millepora* and *Porites* spp, and *B. amplus* lives on several species of the seawhips *Junceella* and *Ellisella* (although usually only on *Junceella fragilis*).

Part of the problem of verifying species-specificity for all these fishes is the reliable identification of the host invertebrate, as the taxonomy of many, such as the sponges and gorgonians, is far from resolved. Another consideration is the question of whether all these fishes are truly commensal. The definition of commensalism assumes that both host and commensal share the same food source to some extent, but this varies among the *Pleurosicya* species, as has been shown above (although in most cases food habits are not known). It is not known if the food items selected by a *Pleurosicya* inhabiting a soft coral are the same types of items the coral would utilise, or whether the fish is using quite a different food source to its host, and therefore only using the host for protection and access to food. Morton (1988) defined the term "aegism" for the association in which the "commensal" mainly derives protection from the "host", which may also include access to a food source. However, this term does not adequately cover the behaviour of these fishes either, whereas the broad concept of "commensalism" seems to best fit these small gobies.

Pleurosicya mossambica, four species of *Bryaninops*, and *Luposicya lupus* have recently been confirmed as protogynous hermaphrodites (Fishelson 1989), and it is likely that most species of the group have this form of reproduction. This reproductive strategy, previously suspected to occur in the group by Larson (1985), is common among small, obligatory invertebrate commensal gobies such as *Gobiodon*, *Paragobiodon* and the Atlantic genus *Gobiosoma*. This has been discussed in detail by Fishelson (1989).

Table 6. Frequency of dorsal and anal ray counts in *Pleurosicya* species

Species	Dorsal rays					Anal rays				
	1,6	1,7	1,8	1,9	Mean	1,6	1,7	1,8	1,9	Mean
annandalei	-	2	19	1	1,8	-	-	20	2	1,8
australis	-	4	-	-	1,9	-	-	4	-	1,8
bilobata	-	2	29	-	1,8	-	2	25	4	1,8
boldinghi	-	19	-	-	1,7	1	1	17	-	1,8
carolinensis	-	-	18	3	1,8	-	-	19	1	1,8
coerulea	-	1	55	2	1,8	-	-	57	1	1,8
elongata	-	-	25	2	1,8	1	1	23	2	1,8
fringilla	-	2	37	2	1,8	-	3	36	2	1,8
labiata	-	2	15	1	1,8	-	-	17	1	1,8
micheli	-	3	31	-	1,8	-	1	31	2	1,8
mossambica	1	4	48	-	1,8	-	1	49	3	1,8
muscarum	-	5	40	-	1,8	-	4	39	2	1,8
occidentalis	1	1	29	1	1,8	-	1	20	1	1,8
plicata	-	2	33	-	1,8	-	1	33	1	1,8
prognatha	-	-	26	2	1,8	-	-	27	1	1,8
spongicola	-	-	3	-	1,8	-	-	3	-	1,8

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